



PERSONAL  
COMPUTER  
SYSTEM

Using the  
Model 5 Printer









# PERSONAL COMPUTER SYSTEM

## Using the Model 5 Printer

Personal Computer Library  
UP-10255  
Y435991100



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# Preface

This book provides information for the SPERRY Model 5 Printer used with the SPERRY Personal Computer System. It includes the following chapters:

## **Chapter 1. Installation**

This chapter describes how to install the printer.

## **Chapter 2. Operation**

This chapter explains basic operating instructions and procedures.

## **Chapter 3. Control Codes**

This chapter provides software codes for controlling printing and other functions.

## **Chapter 4. Maintenance**

This chapter describes how to clean the printer and replace the printhead.

**Appendix A** provides printer specifications.

**Appendix B** describes the parallel interface.

**Appendix C** is a control circuit diagram.

**Appendix D** shows mixed use of printing modes.

**Appendix E** provides a table of character codes.

**Appendix F** shows character fonts.

**Appendix G** is a summary of printer control codes.

An index is located at the back of the book.



## Organization of This Book

Before you begin, look briefly through this book. You will notice that chapters are divided and that each divider page has a table of contents. These divider pages were added to make the book easier to use.

You can search through a chapter to find a main section (printed at the top of every left-hand page). For quick searches through the book, there are key words that indicate a chapter's main topics (in a blue background along the edge of each page).

Changes or additions can be easily inserted in this loose-leaf book. Changes to the Model 5 printer will be printed in this document with each new edition.

### **NOTE:**

Add this book to your SPERRY Personal Computer System Operating Guide.

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# Chapter 1. Installation

## The Model 5 Package

The following items should be included in the Model 5 package:

- Model 5 printer
- Separator
- Ribbon cartridge
- Power cord (European type only)
- This book

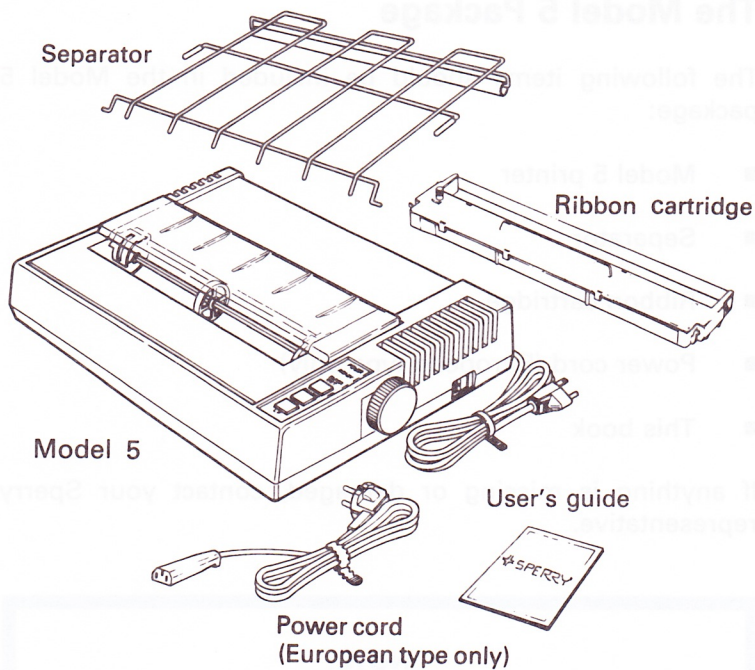
If anything is missing or damaged, contact your Sperry representative.

### NOTE:

It's important to save all original packing materials in case you ever need to reship the printer.

# The Model 5 Package

## I. PACKAGE



# Chapter 1. Installation

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## Installation

This section includes the steps to get your printer ready for operation.

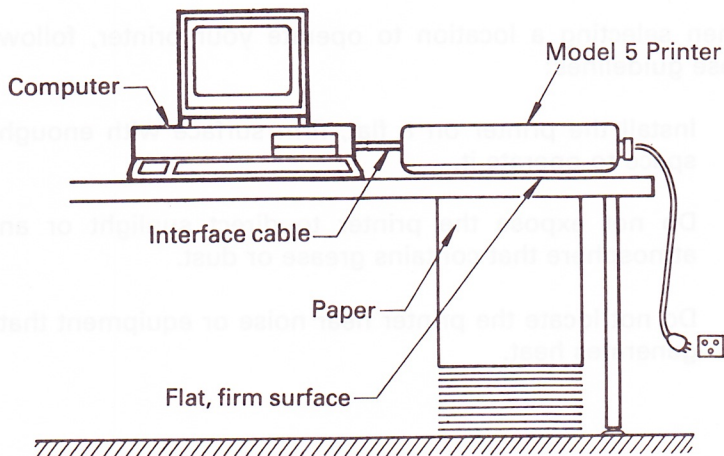
### Printer Site Selection

When selecting a location to operate your printer, follow these guidelines:

1. Install the printer on a flat, firm surface with enough space to operate it.
2. Do not expose the printer to direct sunlight or an atmosphere that contains grease or dust.
3. Do not locate the printer near noise or equipment that generates heat.

# Installation

4. Do not subject the printer to temperatures below 5°C (41°F) or above 35°C (95°F) during operation. Avoid any sudden changes in temperature or extreme shock.





# Chapter 1. Installation

## Installation Steps

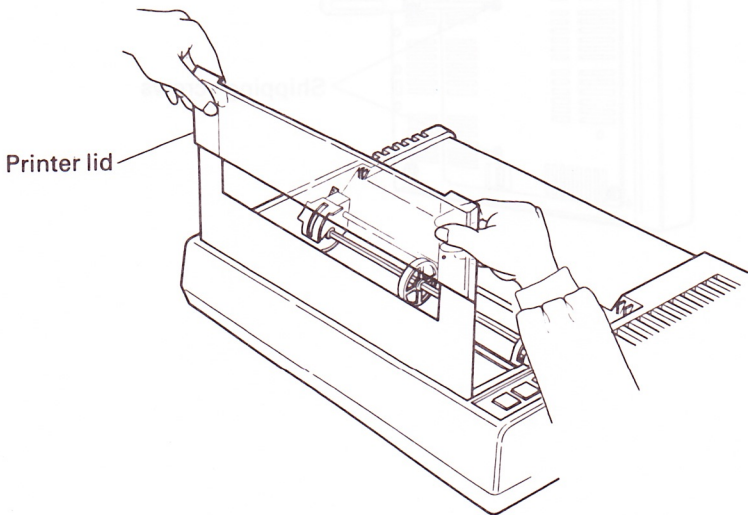
### 1. Remove protective paper.

The printer is shipped with a sheet of protective paper. This paper is inserted to prevent damage from shocks or vibrations.

Before using the printer, remove this protective paper. If you reship the printer, reinsert this paper.

### 2. Remove the printer lid.

Lift the lid upward and off.

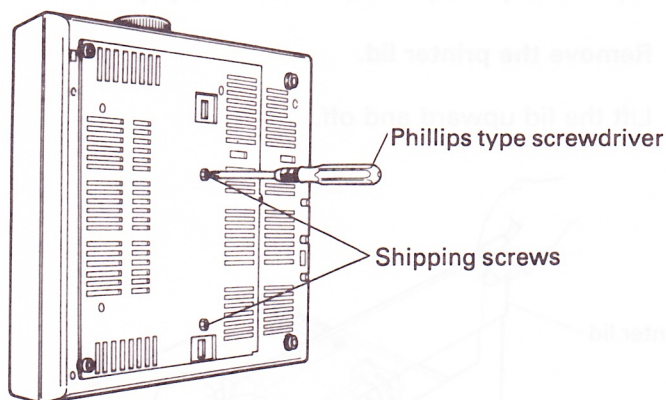


# Installation Chapter 1

## 3. Remove shipping screws.

Shipping screws protect the printer from damage during transportation. Before operating the printer, you must remove these screws.

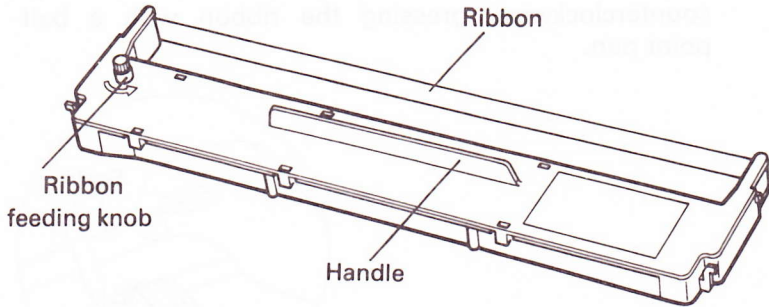
Stand the printer on its left side and remove the two shipping screws on the bottom of the case.



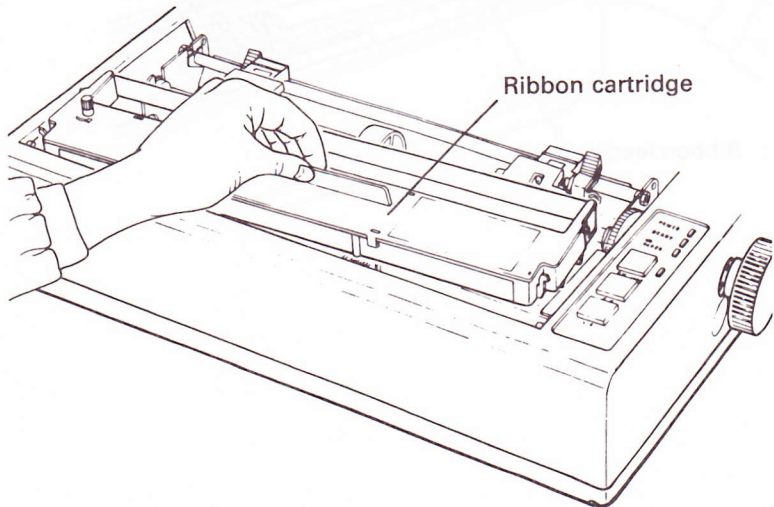
# Chapter 1. Installation

## 4. Install the ribbon.

Take the ribbon cartridge out of the shipping box.



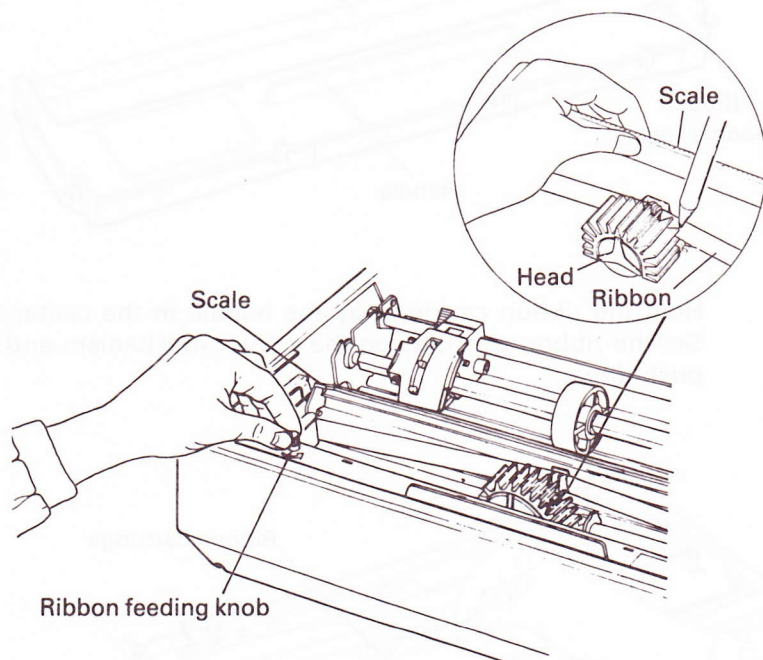
Hold the ribbon cartridge by the handle in the center. Set the ribbon cartridge on the printer mechanism and push down.



# Installation

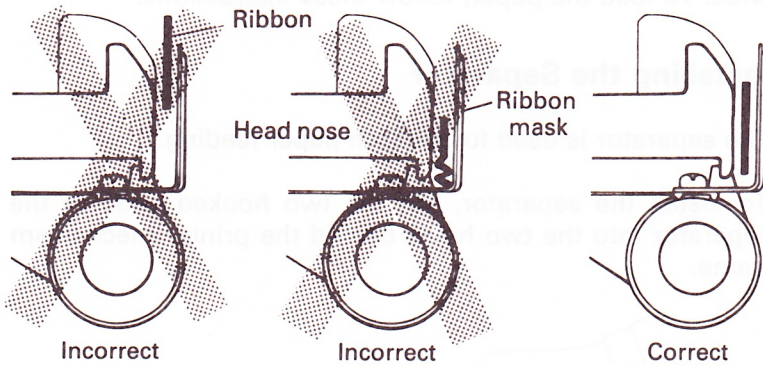
## 5. Position the ribbon.

Position the ribbon between the printhead and the ribbon mask. Hook the ribbon onto the edge of the head. Turn the ribbon feeding knob on the cartridge counterclockwise, pressing the ribbon with a ball-point pen.



# Chapter 1. Installation

Make sure the ribbon is not twisted or creased and the cartridge is secured.



## 6. Adjust ribbon tension.

Turn the ribbon feeding knob counterclockwise to adjust ribbon tension.



# Paper Loading

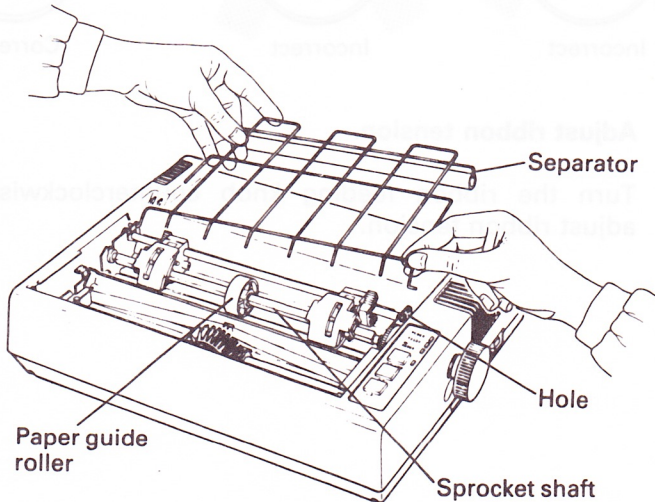
## Paper Loading

The Model 5 printer uses pin-feed paper 4 to 10 inches wide. To load the paper, follow these instructions.

### Installing the Separator

The separator is used for smooth paper feeding.

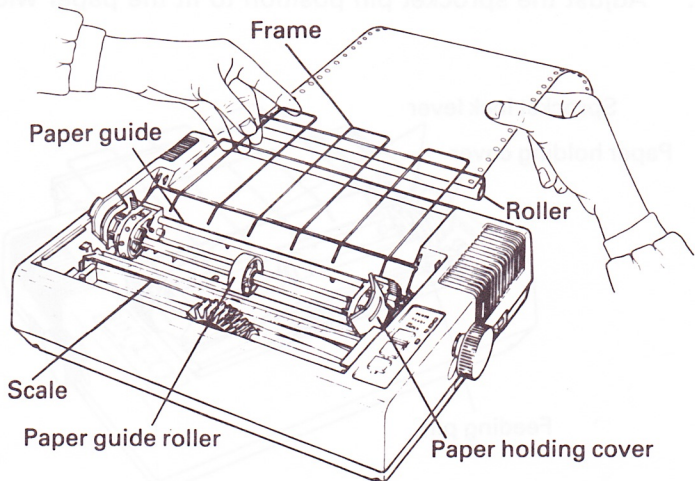
To install the separator, put the two hooked ends of the separator into the two holes behind the printer mechanism frame.



# Chapter 1. Installation

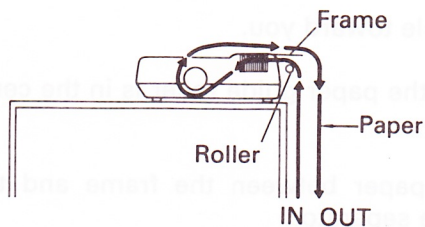
## Loading the Paper

1. Remove the printer lid.
2. Pull the scale toward you.
3. Make sure the paper guide roller is in the center of the printer.
4. Insert the paper between the frame and the plastic roller of the separator.
5. Guide the paper under the gold end of the paper guide and push it through until it comes out the other end.

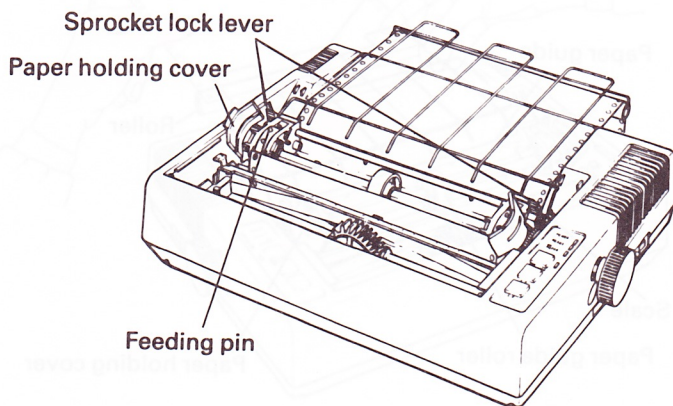


# Paper Loading

6. After you have fed the paper through the paper guide, pull the top of the paper out to some length.

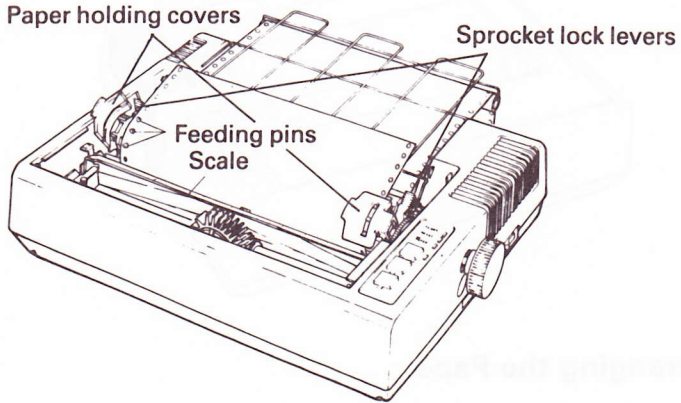


7. Lift the two paper holding covers and the two sprocket lock levers.
8. Adjust the sprocket pin position to fit the paper width.



# Chapter 1. Installation

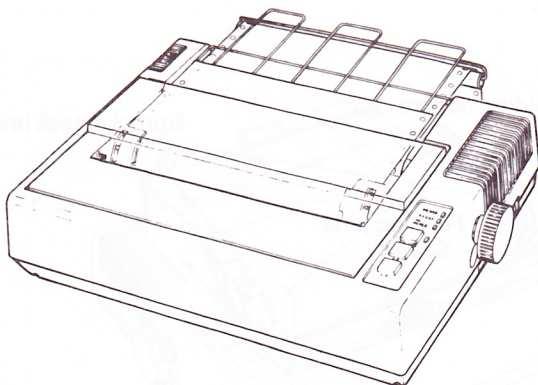
- Put the paper-feed holes on the feeding pins and push the paper holding covers and the sprocket lock levers in place.



- Adjust the tension of the paper and push the scale toward the paper.

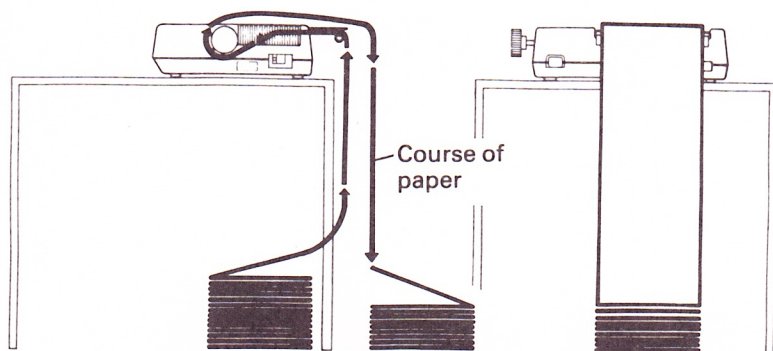
# Paper Loading

11. Replace the printer lid.



## Arranging the Paper

By arranging the pin-feed paper as shown, the paper stacks accordion-style.





# Chapter 1. Installation

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## Removing the Paper

To remove pin-feed paper, use one of these methods:

1. Pull the paper forward and out of the printer. (Do not attempt to pull the paper out from the back of the printer.)
2. Feed the paper out of the printer by pressing the LF (line feed) or FF (form feed) button. Be sure the printer power is on, and the printer is offline.)

# Form Adjustments

---

## Form Adjustments

You can adjust the column layout, top-of-form position setting, and print pressure.

### Column Layout

When you are using paper 4 to 10 inches wide, you can use the gradations on the scale to index print column positions (1 to 80).

### Top of Form

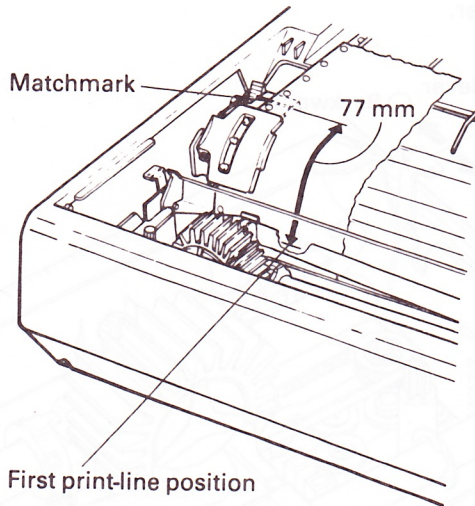
Top of form refers to the first print line on a form. To set top of form:

1. Using the manual paper feed knob, adjust the paper position so that the line position (where you want the first line to be printed) is at the printhead position.
2. This line position automatically becomes top of form when you turn the printer on.

# Chapter 1. Installation

When you are using pre-printed forms, set the top of form by following these steps:

1. Mark on the edge of the paper 77 mm (3 in.) above the first print-line position of the form.
2. Align your mark with the matchmarks on the sprockets by turning the manual paper feed knob.
3. When you turn the printer on, this position becomes top of form.

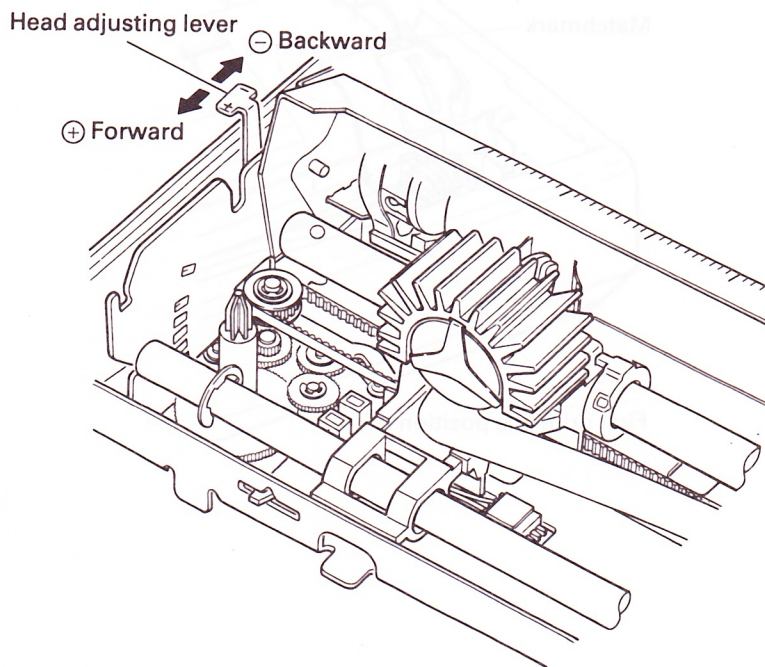


# Form Adjustments

## Print Pressure

To accommodate paper of different thicknesses, adjust the space between the printhead and the paper.

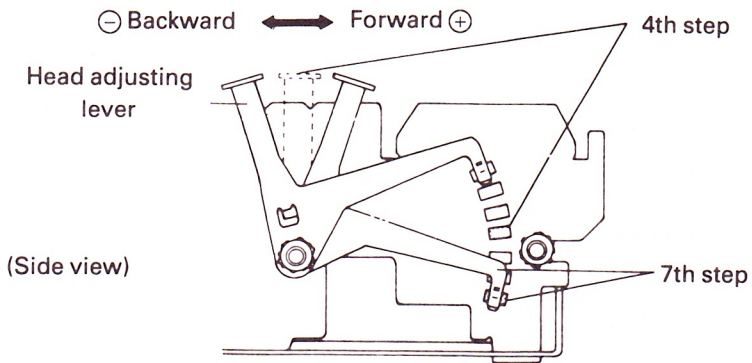
1. Move the head adjusting lever on the left side of the printer either forward or backward:
  - Forward to widen the space for carbon paper sheets.
  - Backward to narrow the space for single-leaf paper.



# Chapter 1. Installation

2. Set the head adjusting lever according to the type of paper you are using.

Paper	Position of adjusting lever
Single-leaf paper	Set the lever to the 4th step
Carbon paper sheets	Set the lever to the 7th step



## NOTE:

If you are using carbon paper, don't print two lines above and below the paper perforations.



# Form Adjustments

**NOTE:**

If printed characters become faint when you have used the printer for an extended period of time, set the head adjusting lever back one step.



**NOTE:**

If you are using carbon paper, don't print two lines above and below the paper perforations.

## Chapter 2. Operation

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## Chapter 2. Operation

### Cable Connections

#### Power Connection

Your SPERRY Model 5 printer operates on one of the following power sources:

AC 120V, 50/60Hz

AC 220V, 50/60Hz

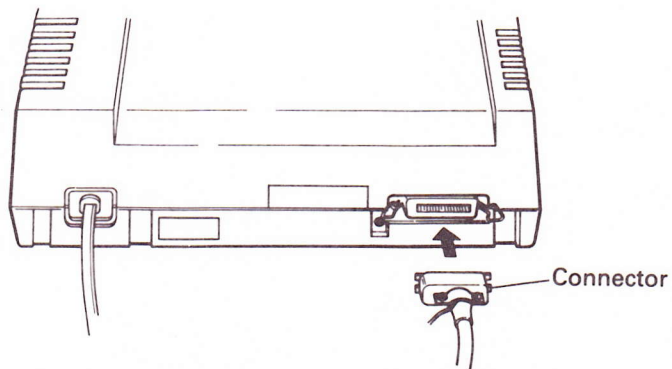
AC 240V, 50/60Hz

Be sure that your printer is compatible with the power source in your area.

#### Printer Cable

Use the printer cable to connect the printer to your SPERRY personal computer.

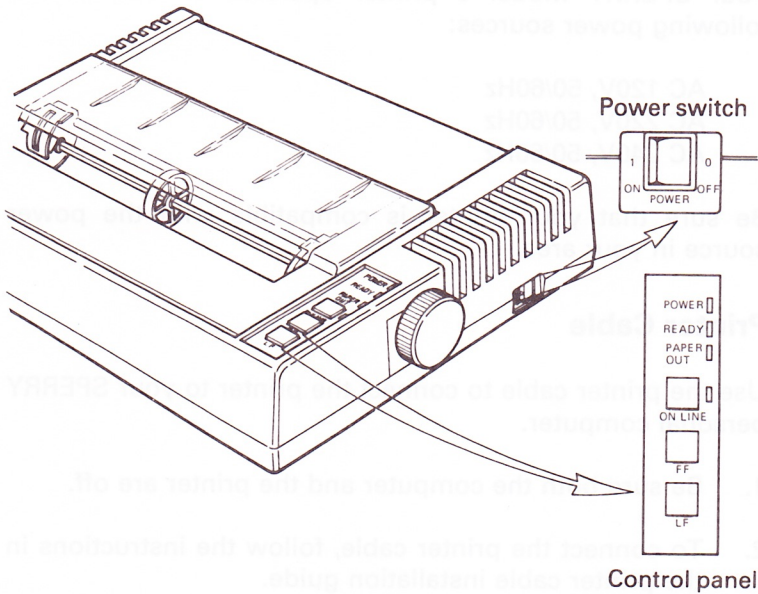
1. Be sure both the computer and the printer are off.
2. To connect the printer cable, follow the instructions in the printer cable installation guide.



# Controls and Indicators

## Controls and Indicators

This section describes the printer control panel and alarm.



## Chapter 2. Operation

### Controls

There are three buttons on the control panel and a power switch on the right side of the printer case.

#### NOTE:

Always load the paper before you turn the printer on.

#### POWER Switch

This switch turns printer power on and off.

#### ON LINE Button

When you turn the printer on, it is automatically online and ready to be used with your SPERRY personal computer. If you press the **ON LINE** button, the printer goes offline. (Press it again to get back online).

The printer automatically goes offline when it is out of paper or if a mechanical problem occurs.

#### FF (Form Feed) Button

Press this button once to advance the paper to the next top-of-form position. The printer must be offline when you use the **FF** button.

#### LF (Line Feed) Button

Press this button once to advance the paper one line. The printer must be offline when you use the **LF** button.

# Controls and Indicators

## Indicators

There are four indicators on the control panel:

- POWER** Lights when power is on.
- READY** Lights when printer is ready to operate.
- PAPER OUT** Lights when paper supply is near its end.
- ON LINE** Lights when the printer is online.

## Alarm

The printer alarm sounds whenever a mechanical error occurs or the printer is out of paper.

## Chapter 2. Operation

### Paper-End Detector

When the paper-end detector (a switch on the paper guide) detects the end of the paper supply, the printer stops printing and goes offline. You can advance the last sheet of paper by pressing the **LF** or **FF** button.

After you load more paper in the printer, press the **ON LINE** button to continue your print operation.

The printer can also be restarted by loading more paper and pressing the power switch off and on again. However, this cancels all previously set parameters such as tabs and line spacing.

If you want to print up to the last line of the paper, disable the paper-end detector by:

1. Setting switch pin 1-5 to the ON position (see page 2-14).
2. Entering control code ESC 8 (see page 3-62).



It is shown here.

```
Z[\]^_`abcdefghijklmnopqrstuvwxyz
[\]^_`abcdefghijklmnopqrstuvwxyz
\]^_`abcdefghijklmnopqrstuvwxyz
]^_`abcdefghijklmnopqrstuvwxyz
^_`abcdefghijklmnopqrstuvwxyz
_`abcdefghijklmnopqrstuvwxyz
`abcdefghijklmnopqrstuvwxyz
abcdefghijklmnopqrstuvwxyz
abcdefghijklmnopqrstuvwxyz
bcdefghijklmnopqrstuvwxyz
cdefghijklmnopqrstuvwxyz
defghijklmnopqrstuvwxyz
efghijklmnopqrstuvwxyz
fghijklmnopqrstuvwxyz
```

**NOTE:**

Be sure there is paper in the printer before you run the self-test.

**NOTE:**

Be sure there is paper in the printer before you run the self-test.

## Chapter 2. Operation

### Printer Startup

To turn on the printer, press the power switch to ON.

You can also turn on the printer by using either of these two methods:

1. Remotely activating the  $\overline{\text{INIT}}$  signal to the parallel interface connector.
2. Using the ESC @ control code (page 3-65).

When the printer is turned on:

1. The printhead returns to home position (far left).
2. The printer is automatically online (unless it is out of paper).
3. The print buffer is cleared.
4. Text mode is selected.
5. The printer is set according to the parameter switch settings (see page 2-8).

# Setting Parameter Switches

## Setting Parameter Switches

You can select certain printer characteristics by setting the two built-in parameter switches inside the printer.

### Accessing the Parameter Switches

#### CAUTION:

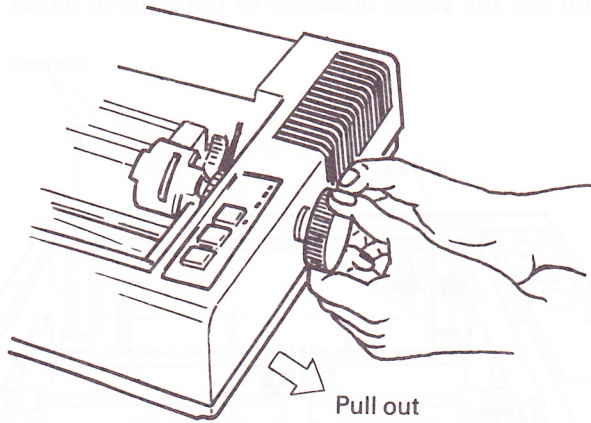
Static electric discharges can damage electronic components in the printer. To avoid damage, eliminate any static electricity from your hands by touching something metal. Avoid touching any components on the circuit boards other than the switches.

To access the parameter switches, follow these steps:

1. Unplug the power cord from the outlet.
2. Remove the paper and the separator.
3. Remove the ribbon cartridge.

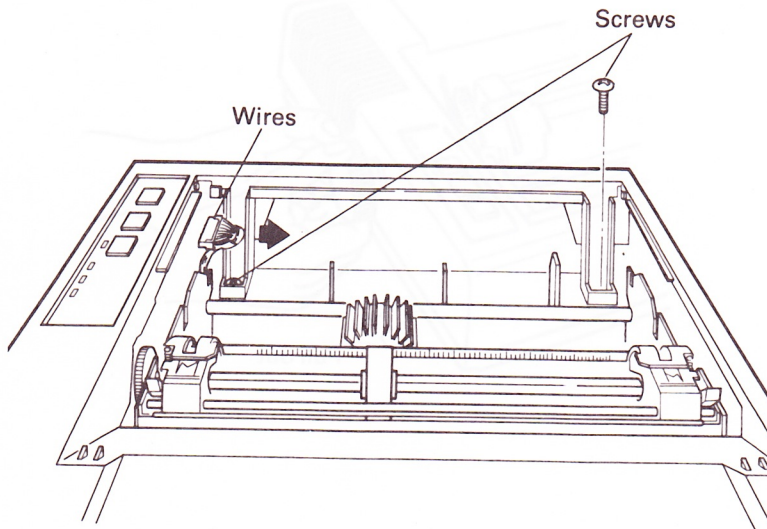
## Chapter 2. Operation

4. Remove the manual paper feed knob by pulling it straight out, with firm but steady pressure.



## Setting Parameter Switches

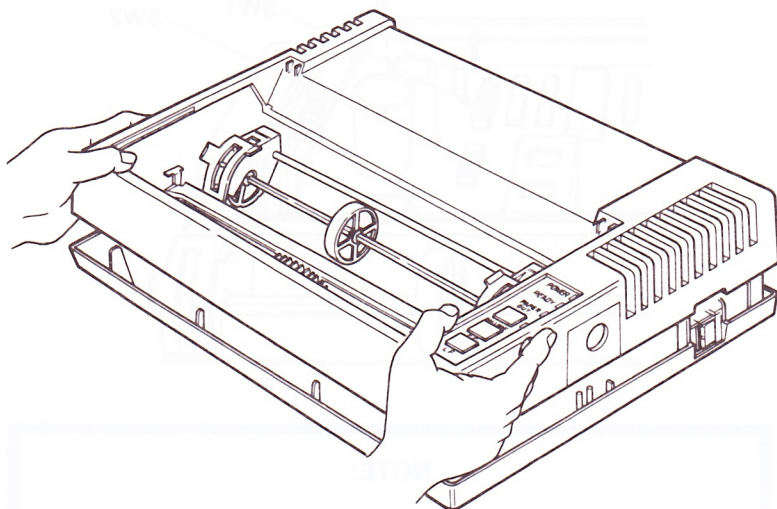
5. Remove the two screws in the upper case of the printer with a Phillips screwdriver.
6. Pull out the wires attached to the control panel.





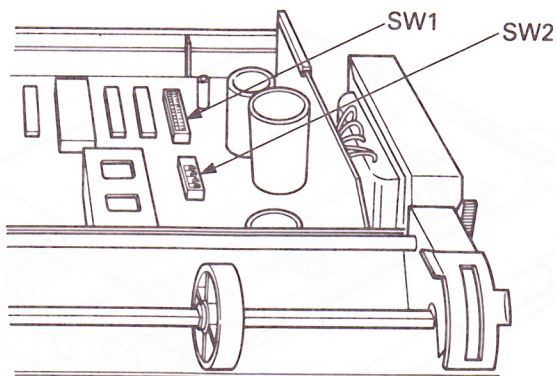
## Chapter 2. Operation

7. Lift up on the edge of the upper case as shown here. Remove the case.



# Setting Parameter Switches

Inside the printer, you will see two switch blocks (SW1 and SW2).

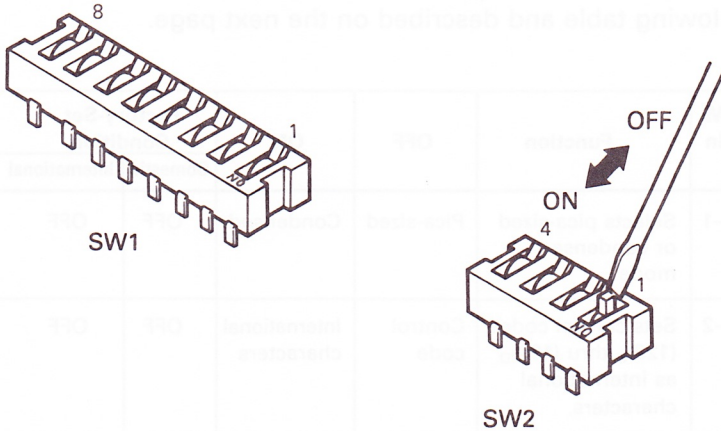


## NOTE:

Make sure the power cord is unplugged before you set the switches.

## Chapter 2. Operation

There are eight switch pins on SW1 and four switch pins on SW2. These pins are set to ON or OFF. The ON setting is indicated on each switch block.



# Setting Parameter Switches

## Switch 1

Parameter switch 1 (SW1) has eight pins. The function of each pin and its preset condition are shown in the following table and described on the next page.

SW Pin	Function	OFF	ON	Factory-Set Condition	
				Domestic	International
1-1	Selects pica-sized or condensed mode.	Pica-sized	Condensed	OFF	OFF
1-2	Sets control codes (128) <sub>D</sub> thru (159) <sub>D</sub> as international characters.	Control code	International characters	OFF	OFF
1-3	Sounds the printer alarm.	Sounds	Does not sound	OFF	OFF
1-4	Form length.	11-inch	12-inch	OFF	ON
1-5	Paper-end detector.	Valid	Invalid	OFF	OFF
1-6	Not used.			ON	ON
1-7	Not used.			ON	ON
1-8	Not used.			ON	ON

## Chapter 2. Operation

Summary of switch 1 pin settings:

<b>SW1-1</b>	When this pin is set to the ON position, the print mode is condensed. In the OFF position, the print mode is pica-sized.
<b>SW1-2</b>	When this pin is set to the ON position, the international characters corresponding to control codes (128) <sub>D</sub> through (159) <sub>D</sub> are selected.
<b>SWi-3</b>	This pin enables or disables the printer alarm. If it is in the ON position, the alarm will not sound; in the OFF position, the alarm will sound. (If a mechanical error occurs, however, the alarm will sound regardless of the pin setting.)
<b>SW1-4</b>	When this pin is in the ON position, the form length per page is 12 inches. In the OFF position, the page length is 11 inches.
<b>SW1-5</b>	This pin enables or disables the paper-end detector: if it is in the ON position, the detector will not function; in the OFF position, the detector functions.
<b>SW1-6</b> <b>SW1-7</b> <b>SW1-8</b>	These pins are not used, and must be in the ON position.



# Setting Parameter Switches

## Switch 2

Parameter switch 2 (SW2) has four pins. The functions of each pin and its preset condition are shown in the following table and described on the next page.

SW Pin	Function	OFF	ON	Factory-set condition
2-1	ZERO font.	0	∅	OFF
2-2	SLCT IN signal internally fixed or not fixed.	Not fixed	Fixed	ON
2-3	Automatic line feed.	LF must be from computer.	Auto LF with CR	OFF
2-4	1-inch skip-over perforation.	Invalid	Valid	OFF

## Chapter 2. Operation

Summary of switch 2 pin settings:

- |              |   |
|--------------|---|
| <b>SW2-1</b> | When this pin is set to the ON position, the zero character is printed with a slash (Ø).  |
| <b>SW2-2</b> | When this pin is set to the OFF position, the <u>SLCT IN</u> signal is not fixed internally, allowing the computer to control the printer.  |
| <b>SW2-3</b> | Setting this pin to the ON position provides automatic line feed with each carriage return. When set to the OFF position, automatic line feeds must be provided through the software.           |
| <b>SW2-4</b> | When in the ON position, this pin sets the automatic skip-over perforation function (paper automatically advances to the first line of the next page when the remaining page length is 1 inch.) |

After setting the switches, reassemble the printer reversing steps 1 through 7.



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## Chapter 3. Control Codes

Various software controls (control codes) are discussed in this chapter. Programmers use these control codes to program certain print functions.

When control codes are sent from the computer to the printer, their functions (such as form feed or line feed) are executed immediately.

Two standard operation modes are available with the Model 5. One is the text mode which prints characters (standard ASCII coded inputs). The other is the bit image mode. This mode prints pictures and images in dot configuration.

In this chapter, control codes are divided into two groups: text mode control codes and bit image control codes. Parameters set in the text mode are also effective in the bit image mode.

Each printer control code is described in this chapter. The descriptions are as follows:

<b>Expression</b>	Shows the correct format for using the code.
<b>Function</b>	States the purpose of the code.
<b>Remarks</b>	Describes the use of the code in more detail.
<b>Reference</b>	Lists related control codes.
<b>Example</b>	Shows samples that demonstrate the use of the code.



# Definition of Terms

## Definition of Terms

Terms essential to programming control codes are discussed in this section.

### 2 (Binary), D (Decimal) and H (Hexadecimal)

$( )_2$ ,  $( )_D$ , and  $< >_H$  represent binary, decimal and hexadecimal numbers.

Although the control codes are described in decimal notation, you must be familiar with binary notation to use the bit image mode.

### ASCII Code

Computers use "bits" (binary digits) grouped together as codes to represent characters and numbers.

ASCII (American Standard Code for Information Interchange) is a standardized code used to transmit data. The bit group  $(01000001)_2 = (65)_D = <41>_H$  represents the ASCII character "A".

The Model 5 printer has an ASCII 96-character set, 32 control codes, 37 symbol characters, 50 graphic characters and 41 international characters. Letters, numbers, and special symbols are addressed from  $(32)_D$  to  $(126)_D$  and from  $(128)_D$  to  $(255)_D$ .

## Chapter 3. Control Codes

### Escape Codes

Control codes called the ESC sequence expand the processing capabilities of the Model 5 printer. ESC code (27)<sub>D</sub> followed by any alphanumeric or symbolic character provides special functions such as setting column length or entering bit image mode.

Generally, printer control codes such as ESC are not standardized. Each manufacturer has its own meaning for such codes.

Don't confuse escape codes with the escape keys on some keyboards.

### Buffer-Full Print

The print buffer temporarily stores data for input to the printer. The print buffer stores only the print data, not commands.

When a full line of print data (including spaces) has been stored in the print buffer and the next data is printable, data in the print buffer is automatically printed, followed by a line feed. This is called "buffer-full print".

A buffer-full print (set by the SO code) cancels the enlarged print mode (see page 3-16).

# Definition of Terms

---

## Buffer Column Widths

When you turn on the power to the printer, the column width in each print mode is either pica-sized mode (80 columns) or condensed mode (132 columns).

The column width may be changed by using the ESC Q code (right-margin setting). When the right margin is set as an absolute position, the column width set to 80 columns in the pica-sized mode becomes 137 columns in the condensed mode.

When the left margin is set by using ESC 1, the print buffer becomes full at the right-margin setting which is in effect at that time.

## Hex Dump

If you execute or list programs in hex dump, all data sent from the computer is printed in hexadecimal notation.

For example, when you send the following statement to the printer:

```
LPRINT CHR$(0);CHR$(27);"A";CHR$(24);
```

the data is printed in hexadecimal notation:

```
00 1B 41 18
```

In some programming languages (such as BASIC and Pascal), a few codes cannot be sent to the printer. You can use hex dump to find out if the correct codes are being sent to the printer.

## Chapter 3. Control Codes

To perform a hex dump, turn the power on while pressing both the **LF** and **FF** buttons.

You can only print by hex dump when the printer is buffer-full. The data remaining in the print buffer can be printed when the printer is offline.

A hex dump cannot be cancelled during a print operation.

# How to Send Control Codes

## How to Send Control Codes

Control codes can be divided into two categories:

- One-byte control codes
- Control codes expanded with an ESC code

In BASIC, you can send control codes to the printer in the following formats:

1. To send BEL code:

```
LPRINT CHR$(7);
```

2. To send ESC – code:

```
LPRINT CHR$(27);"-";CHR$(1);
```

### NOTE:

Program examples have been written in Microsoft BASIC\*. For more information about BASIC, refer to Programming in BASIC, UP-10134.

BASIC language varies depending on the specifications of the computer. In some versions, certain codes (such as CHR\$(9) and CHR\$(13)) cannot be sent to the printer.

*\*Microsoft BASIC is a trademark of Microsoft*



## Chapter 3. Control Codes

### Control Codes in the Text Mode

#### Print Execution

#### CR (Carriage Return)

##### Expression

```
CHR$(13);
```

##### Function

Starts printing.

##### Remarks

All the data stored in the print buffer is printed.

If AUTO FEED XT (pin no. 14 of the interface connector) is at LOW level or if switch pin 2-3 is set to ON, the paper advances one line automatically.

Paper feed is set by ESC 0, ESC 1, ESC 2, ESC 3, or ESC A.

Using the CR code with line feed cancels the enlarged print mode set by the SO code.

If no data precedes the CR code, or if all preceding data are spaces, the carriage assembly does not move. Under this condition, if AUTO FEED XT is at LOW level or if switch pin 2-3 is on, the paper advances one line.

##### Reference

LF

# Print Execution

---

## LF (Line Feed)

### Expression

`CHR$(10);`

### Function

Advances paper one line.

### Remarks

All the data stored in the print buffer is printed; then, line feed is performed.

If no data precedes the LF code, or if all preceding data are spaces, only line feed is performed.

This code cancels the enlarged print mode set by the SO code. Paper feed may be set by ESC 0, ESC 1, ESC 2, ESC 3, or ESC A code. If data is input in the order of print data → CR → LF, data is printed by the CR code. Then the printer performs one line feed because no print data precedes the LF code.

If the skip-over perforation code has been set, the paper is fed to the top-of-form position of the next sheet.

### Reference

SO, ESC 0, ESC 1, ESC 2, ESC 3, ESC A, ESC W.

## Chapter 3. Control Codes

### ESC J

#### Expression

```
CHR$(27);"J";CHR$(n);  
(0 ≤ n ≤ 255)
```

#### Function

Feeds n/216-inch line spacing for one line.

#### Remarks

The printer prints the data in the print buffer and executes n/216-inch paper feed.

#### Reference

ESC 3

#### Example

To execute 113/216-inch line spacing:

```
10 LPRINT "      FREE INFORMATION!"  
20 LPRINT CHR$(27);"J";CHR$(113)  
30 LPRINT "User Inquiry Service"  
40 LPRINT "      from SPERRY"
```

FREE INFORMATION!

User Inquiry Service  
from SPERRY

## Print Execution Chapter 3

### NOTE:

With  $n=1$  and  $n=2$ , paper feeding accuracy is not guaranteed. If the value of  $n$  is set to 0, no paper feed is performed.

The ESC 3 code causes the same  $n/216$ -inch line spacing as the ESC J code.

## Chapter 3. Control Codes

### FF (Form Feed)

#### Expression

```
CHR$(12);
```

#### Function

Advances paper to next top of form.

#### Remarks

All the data stored in the print buffer is printed; then, paper feed is performed according to the predetermined form length.

If no print data is stored in the print buffer, print operations do not take place; paper is fed to the top-of-form position of the next page. This code cancels the enlarged print mode set by the SO code.

#### Reference

ESC C



# Print Mode

## Print Mode

### ESC M

#### Expression

`CHR$(27);"M"`

#### Function

Sets elite-sized character.

#### Remarks

The data following this code is printed in elite-sized characters (12 characters per inch). In this mode, use of the emphasized or condensed print code affects only the internal flag of the printer. The print mode does not change.

#### Reference

ESC P, SI, DC2, ESC E, ESC F

#### Example

```
10 'Elite-sized Printing
20 LPRINT "Pica-sized Character"
30 LPRINT CHR$(27);"M";
40 LPRINT "Elite-sized Character"
```

```
Pica-sized Character
Elite-sized Character
```

## Chapter 3. Control Codes

### ESC P

#### Expression

```
CHR$(27);"P";
```

#### Function

Cancels the ESC M code.

#### Remarks

The elite-sized print mode set by the ESC M code is cancelled and the printer returns to pica-sized print. ESC P only cancels the ESC M code. It does not cancel print modes such as enlarged or condensed.

#### Reference

ESC M

#### Example

```
10 'Pica-sized Printing
20 LPRINT CHR$(27);"P";
30 LPRINT "Pica-sized Character"
40 LPRINT
50 LPRINT CHR$(27);"M"
60 "Elite-sized Character"
70 LPRINT
80 LPRINT CHR$(27);"P";
90 LPRINT "Pica-sized Character again"
```

Pica-sized Character

Elite-sized Character

Pica-sized Character again

# Print Mode

## SO (Shift Out)

### Expression

`CHR$(14);`

### Function

Sets enlarged print mode.

### Remarks

All data that follows this code on the same line is printed in enlarged characters. This code is cancelled by line feed, DC4, or ESC W.

### Reference

DC4, ESC W

### Example

```
10 'Enlarged mode with auto-reset
20 LPRINT CHR$(14);
30 LPRINT "Enlarged"
40 LPRINT "Pica-sized"
```

Enlarged  
Pica-sized

### NOTE:

The only difference between the SO code and the ESC W code is that the SO code is cancelled by a line feed.

## Chapter 3. Control Codes

### DC4

#### Expression

```
CHR$(20);
```

#### Function

Cancels enlarged print mode.

#### Remarks

The DC4 code cancels the enlarged print mode set by the SO code.

#### Reference

SO, ESC W

#### Example

```
10 'Enlarged Mode Cancel
20 LPRINT CHR$(14);
30 LPRINT "Enlarged";
40 LPRINT CHR$(20);
50 LPRINT "      Pica-sized"
```

Enlarged      Pica-sized

#### NOTE:

This code does not cancel the enlarged print mode set by the ESC W code.

# Print Mode

## ESC W

### Expression

```
CHR$(27);"W";CHR$(n);  
n=1 or 49: Sets Enlarged print mode  
n=0 or 48: Cancels Enlarged print mode
```

### Function

Sets/cancels enlarged print mode.

### Remarks

Sets enlarged print mode (n=1 or 49). All the data following ESC W (1)<sub>D</sub> or ESC W (49)<sub>D</sub> is printed in enlarged characters. This code is not cancelled by a line feed. To cancel this code, input ESC W (0)<sub>D</sub> or ESC W (48)<sub>D</sub>.

Cancels enlarged print mode (n=0 or 48). ESC W (0)<sub>D</sub> or ESC W (48)<sub>D</sub> cancels the enlarged mode set by ESC W (1)<sub>D</sub>, ESC W (49)<sub>D</sub>, or SO.

### Reference

SO, DC4

### Example

```
10 'Enlarged Mode by ESC W  
20 LPRINT CHR$(27);"W";CHR$(1);  
30 LPRINT "Enlarged"  
40 LPRINT CHR$(27);"W";CHR$(0);  
50 LPRINT "Pica-sized"
```

Enlarged

Pica-sized



## Chapter 3. Control Codes

### SI (Shift In)

#### Expression

`CHR$(15);`

#### Function

Sets condensed print mode.

#### Remarks

1. When pica-sized characters are selected, the SI code prints all the data stored in the buffer (and all subsequent data) as condensed characters (17 characters per inch). Input of a DC2 code cancels this code.

If the SO and ST codes are input in condensed print mode, condensed enlarged characters are printed.

If emphasized print mode is set using the ESC E code, the SI code is processed in the printer and actual print mode does not change. In this case, if the emphasized print mode is cancelled by using the ESC F code, characters are printed in condensed print mode. The emphasized print mode take precedence over the condensed print mode.

2. When elite-sized characters are selected, the SI code affects only the internal flag of the printer. The print mode does not change unless the elite-sized character mode is cancelled by using the ESC P code.

# Print Mode

## Reference

DC2, ESC M

## Example 1

```
10 'Condensed Mode
20 LPRINT CHR$(15);"Condensed"
30 LPRINT "Still in Condensed"
```

Condensed  
Still in Condensed

## Example 2

```
10 'Condensed & enlarged mode
20 LPRINT CHR$(15);"Condensed mode"
30 LPRINT CHR$(14);"Now in condensed+enlarged mode"
40 END
```

Condensed mode  
**Now in condensed+enlarged mode**

## Chapter 3. Control Codes

### DC2

#### Expression

`CHR$(18);`

#### Function

Cancels condensed print mode.

#### Remarks

1. When pica-sized characters are selected, the DC2 code cancels the condensed print mode set by the SI code.
2. When elite-sized characters are selected, the DC2 code affects only the internal flag of the printer. The print mode does not change unless the elite-sized character mode is cancelled by the ESC P code.

#### Reference

SI, ESC M

#### Example

```
10 'Condensed Mode Cancel
20 LPRINT CHR$(15);
30 LPRINT "Condensed"
40 LPRINT
50 LPRINT CHR$(18);
60 LPRINT "Pica-sized"
```

Condensed

Pica-sized

# Print Mode

**NOTE:**

Although the enlarged print mode set by the SO code can be cancelled by line feed, the condensed print mode set by the SI code cannot.

## Chapter 3. Control Codes

### ESC – [minus]

#### Expression

```
CHR$(27);"–";CHR$(n);  
n=1 or 49: Sets Underline print mode  
n=0 or 48: Cancels Underline print mode
```

#### Function

Sets/cancels underline print mode.

#### Remarks

1. Sets underline print mode (n=1 or 49). ESC – (1)<sub>D</sub> or ESC – (49)<sub>D</sub> causes all the data following this code to be printed underlined.

This mode is ignored in the bit image print mode. The underline is printed beneath each character as a continuous line in all print modes. When the double-strike print mode is set by the ESC G code, the underline is printed in double-strike.

2. Cancels underline print mode (n=0 or 48). ESC – (0)<sub>D</sub> or ESC – (48)<sub>D</sub> cancels the underline print mode. All the data following this code is printed without any underline.

#### Example

```
10 'Underline Mode  
20 LPRINT CHR$(27);"–";CHR$(1);  
30 LPRINT "Moon River"  
40 LPRINT CHR$(27);"–";CHR$(0);  
50 LPRINT "      Wider than a mile"
```

```
Moon River  
Wider than a mile
```



# Print Mode

---

## ESC E

### Expression

```
CHR$(27);"E";
```

### Function

Sets emphasized print mode.

### Remarks

1. If pica-sized characters are selected, ESC E causes all the data stored in the print buffer to be printed; then, the data following this code is printed in emphasized characters. Emphasized printing gives each character a stronger impression.

This code can be input at any column position on a line. Print speed reduces to 50 cps (characters per second) while printing emphasized characters.

This print mode can be cancelled by using an ESC F code.

2. If elite-sized characters are selected, ESC E affects only the internal flag of the printer. It does not affect the print mode unless the elite-sized character mode is cancelled by the ESC P code.

### Reference

ESC F, ESC M

## Chapter 3. Control Codes

### ESC F

#### Expression

```
CHR$(27);"F";
```

#### Function

Cancels emphasized print mode.

#### Remarks

1. If pica-sized characters are selected, the ESC F code cancels the emphasized print mode set by the ESC E code.
2. If elite-sized characters are selected, ESC F affects only the internal flag of the printer. It does not affect the print mode unless elite-sized mode is cancelled by the ESC P code.

#### Reference

ESC E, ESC M

#### Example

```
10 'Emphasized Mode
20 LPRINT CHR$(27);"E";
30 LPRINT "Emphasized";
40 LPRINT CHR$(27);"F";
50 LPRINT "      Pica-sized"
```

**Emphasized**      Pica-sized

# Print Mode

---

## ESC G

### Expression

`CHR$(27);"G";`

### Function

Sets double-strike print mode.

### Remarks

All the data stored in the printer buffer is printed; then, the data following this code is printed in double-strike print mode.

In this mode, the printer completes one line of printing by two passes of the printhead while advancing the paper by about 1/216-inch between the first pass and the second pass. The printer adjusts paper feeding to maintain the absolute length and number of lines per page. This eliminates the vertical gap between dots, enabling high-quality printing.

### Reference

ESC H

## Chapter 3. Control Codes

### ESC H

#### Expression

```
CHR$(27);"H";
```

#### Function

Cancels double-strike print mode.

#### Remarks

The ESC H code cancels the double-strike print mode set by the ESC G code.

#### Reference

ESC G

#### Example

```
10 'Double-strike mode
20 LPRINT CHR$(27);"G";
30 LPRINT "Double Print"
40 LPRINT CHR$(27);"H";
50 LPRINT "Normal Print"
60 END
```

```
Double Print
Normal Print
```

# Print Mode

---

## ESC S

### Expression

CHR\$(27);"S";CHR\$(n);

n=0 or 48: Sets superscript print mode

n=1 or 49: Sets subscript print mode

### Function

Sets superscript/subscript mode.

### Remarks

1. Sets superscript print mode (n=0 or 48). ESC S (0)<sub>D</sub> or ESC S (48)<sub>D</sub> causes all the data following this code to be printed in superscript print mode. In this mode, a character measuring 1.6 mm (height) is printed on the upperhalf of a line.

The ESC T code cancels this code.

2. Sets subscript print mode (n=1 or 49). ESC S (1)<sub>D</sub> or ESC S (49)<sub>D</sub> causes the data following this code to be printed in subscript print mode. In this mode, a character measuring 1.6 mm (height) is printed on the lower half of a line.

The ESC T code cancels this code.

### Reference

ESC T



## Chapter 3. Control Codes

### Example 1

```
10 'Superscript Mode
20 LPRINT CHR$(27);"E";
30 LPRINT "Y=aX";CHR$(27);"F";
40 LPRINT CHR$(27);"S";CHR$(0);CHR$(15);
50 LPRINT "3";
60 LPRINT CHR$(27);"T";CHR$(18);
70 LPRINT CHR$(27);"E";
80 LPRINT "+bX";CHR$(27);"F";
90 LPRINT CHR$(27);"S";CHR$(0);CHR$(15);
100 LPRINT "2";
110 LPRINT CHR$(27);"T";CHR$(18);
120 LPRINT CHR$(27);"E";
130 LPRINT "+cX+d"
```

$$Y=aX^3+bX^2+cX+d$$

### Example 2

```
10 'Subscript Mode
20 LPRINT CHR$(27);"E";
30 LPRINT "H";CHR$(27);"F";
40 LPRINT CHR$(27);"S";CHR$(1);CHR$(15);
50 LPRINT "2";
60 LPRINT CHR$(27);"T";CHR$(18);
70 LPRINT CHR$(27);"E";
80 LPRINT "O"
```



# Print Mode

---

## NOTE:

In both the superscript and subscript print modes, the printer performs unidirectional, double-strike printing. After the first pass of the printhead, the paper will advance 1/216-inch and a character is formed on completion of the second pass. The printer adjusts paper feeding to maintain the absolute length and number of lines per page. Because of this adjustment, superscript or subscript may, in the worst case, be printed improperly.

# Chapter 3. Control Codes

## ESC T

### Expression

```
CHR$(27);"T";
```

### Function

Cancels superscript/subscript print mode.

### Remarks

The ESC T code cancels the superscript or subscript print mode set by the ESC S code.

### Reference

ESC S

# Print Mode

## BS (Backspace)

### Expression

CHR\$(8);

### Function

Prints and moves back one character.

### Remarks

When this code is input, all the data stored in the print buffer is printed and the next print start position returns left by one column.

In the enlarged print mode, the print position is backspaced by two pica-sized characters. BS is not guaranteed if the print mode has been changed.

### Reference

DEL

### Example 1

```
10 'Backspace Ex. 1
20 LPRINT "YYYYY";
30 LPRINT CHR$(8);CHR$(8);
40 LPRINT "=====
```

YYYYYY=====

## Chapter 3. Control Codes

### Example 2

```
10 'Backspace Ex. 2
20 LPRINT CHR$(27);"W";CHR$(2);
30 LPRINT "<<<<<";
40 LPRINT CHR$(8);CHR$(8);
50 LPRINT CHR$(27);"W";CHR$(0);
60 LPRINT "-----"
```

<<<<<-----



# Print Mode

---

## Character Set Selection

### ESC 6

#### Expression

```
CHR$(27);"6";
```

#### Function

Selects character set 2.

#### Reference

ESC 7

## Chapter 3. Control Codes

### ESC 7

#### Expression

```
CHR$(27);"7";
```

#### Function

Selects character set 1.

#### Reference

ESC 6

# Line Spacing

---

## Line Spacing

### ESC 0 [zero]

#### Expression

```
CHR$(27);"0";
```

#### Function

Sets 1/8 inch line spacing.

#### Remarks

The ESC 0 code sets subsequent line spacing to 1/8 inch.

#### Reference

ESC 1, ESC 2, ESC 3, ESC A

#### Example

```
10 '1/8 inch Line Spacing
20 LPRINT CHR$(27);"0";
30 FOR I=1 TO 5
40 LPRINT "1/8 inch Line Spacing"
50 NEXT
60 END
```

```
1/8 inch Line Spacing
1/8 inch Line Spacing
1/8 inch Line Spacing
1/8 inch Line Spacing
1/8 inch Line Spacing
```

# Chapter 3. Control Codes

## ESC 1

### Expression

```
CHR$(27);"1";
```

### Function

Sets 7/72 inch line spacing.

### Remarks

The ESC 1 code sets subsequent line spacing to 7/72 inch.

### Reference

ESC 0, ESC 2, ESC 3, ESC A

### Example

```
10 '7/72 inch Line Spacing
20 LPRINT CHR$(27);"1";
30 FOR I=1 TO 5
40 LPRINT "7/72 inch Line Spacing"
50 NEXT
60 END
```

```
7/72 inch Line Spacing
7/72 inch Line Spacing
7/72 inch Line Spacing
```

### NOTE:

7/72 inch line spacing causes no space between characters in two succeeding lines.

# Line Spacing

---

## ESC 2

### Expression

```
CHR$(27)"2";
```

### Function

Sets 1/6 inch line spacing.

### Remarks

The ESC 2 code sets subsequent line spacing to 1/6 inch.

### Reference

ESC 0, ESC 1, ESC 3, ESC A

### Example

```
10 '1/6 inch Line Spacing
20 LPRINT CHR$(27);"2";
30 FOR I=TO 5
40 LPRINT "1/6 inch Line Spacing"
50 NEXT
60 END
```

```
1/6 inch Line Spacing
1/6 inch Line Spacing
1/6 inch Line Spacing
1/6 inch Line Spacing
1/6 inch Line Spacing
```



## Chapter 3. Control Codes

### ESC 3

#### Expression

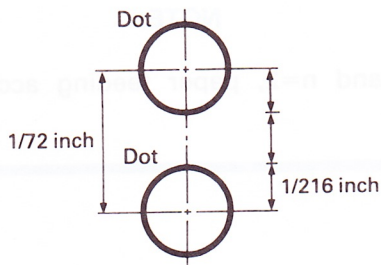
```
CHR$(27);"3";CHR$(n);  
(0 ≤ n ≤ 255)
```

#### Function

Sets  $n/216$  inch line spacing.

#### Remarks

This code sets the amount of line spacing in units  $1/3$  the size of the space-adjacent dots.



The ESC 3 ( $n$ )<sub>D</sub> code sets subsequent line spacing to  $n/216$  inch.

#### Reference

ESC 0, ESC 1, ESC 2, ESC A

# Line Spacing

## Example

To set 20/216 (5/54) inch line spacing:

```
10 'n/216 inch Line Spacing
20 LPRINT CHR$(27);"3";CHR$(20);
30 FOR I =1 TO 5
40 LPRINT "20/216 inch Line Spacing"
50 NEXT
60 END
```

```
20/216 inch Line Spacing
20/216 inch Line Spacing
20/216 inch Line Spacing
20/216 inch Line Spacing
20/216 inch Line Spacing
```

### NOTE:

With  $n=1$  and  $n=2$ , paper feeding accuracy is not guaranteed.

## Chapter 3. Control Codes

### ESC A

#### Expression

```
CHR$(27);"A";CHR$(n);  
(0 ≤ n ≤ 85)
```

#### Function

Sets  $n/72$  inch line spacing.

#### Remarks

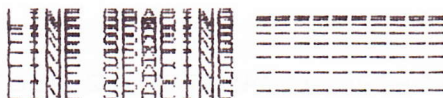
This code sets line spacing to  $n/72$  inch. When  $n=1$  (i.e.,  $1/72$  inch), the amount of space between each line equals the space between two adjacent dot wires in the printhead.

#### Reference

ESC 0, ESC 1, ESC 2, ESC 3

#### Example

```
10 'Line Spacing by dots  
20 FOR I=1 TO 8  
30 LPRINT CHR$(27);"A";CHR$(I);  
40 LPRINT "LINE SPACING -----"  
50 NEXT  
60 END
```



# Format Control

## Format Control

### HT (Horizontal TAB)

#### Expression

`CHR$(9);`

#### Function

Horizontal tabulation.

#### Remarks

This code sets the horizontal tab to the predetermined horizontal tab unit set by the ESC e code. When the power is turned on, tab is automatically set every 8 characters. Multiple HT codes set the horizontal tab to the position of the horizontal tab unit multiplied by the number of HT codes.

#### Reference

ESC D

#### Example

```
10 'Horizontal TAB
20 LPRINT "012345678901234567890123456789"
30 FOR I=1 TO 5
40 LPRINT CHR$(9);"TAB";
50 NEXT
```

```

012345678901234567890123456789
      ↑           ↑           ↑
TAB set Column 0 Column 8   TAB   TAB   TAB
```

## Chapter 3. Control Codes

### NOTES:

1. If the print position set by this code exceeds the column end, data is printed out at the column head of the next line.
2. If the left margin is changed by ESC 1 code, the new left margin becomes the start position of the horizontal tab.



# Format Control

---

## VT (Vertical TAB)

### Expression

`CHR$(11);`

### Function

Vertical tabulation.

### Remarks

All the data stored in the print buffer is printed; then, line feed is carried out to the predetermined vertical tab unit set by the ESC e code.

If the vertical tab unit is not predetermined, this code functions the same as the LF code.

Multiple VT codes set the vertical tab to the position of the vertical tab unit multiplied by the number of VT codes.

### Reference

ESC B

## Chapter 3. Control Codes

### Example

```
10 Vertical TAB
20 LPRINT CHR$(27);"e";CHR$(1);CHR$(2);
30 LPRINT "VT";
40 LPRINT CHR$(11);"VT";
50 LPRINT CHR$(11);CHR$(11);"VT";
60 LPRINT CHR$(11);CHR$(11);CHR$(11);"VT";
```

VT

VT

VT

VT

#### NOTE:

This code cancels the enlarged print mode set by the SO code.

# Format Control

## ESC B

### Expression

```
CHR$(27);"B";CHR$(n1);CHR$(n2);. . .  
CHR$(nK);CHR$(0 or 128);
```

### Function

Sets vertical tab stop positions.

### Remarks

The printer accepts up to 64 vertical tab stop positions. The n's in the format above indicate tab stop positions. Tab stop numbers must be received in numerical order.

The tab stop numbers are not valid until the NUL code is input. Once vertical tab stops are established, they are in effect until new stops are specified. (If the printer is reset or turned off, tab stops set using this code are cleared.) If no tab stop is set, the VT code acts as a line feed command.

ESC B followed only by NUL cancels tab stops.

Form length must be set by the ESC C command before you set tabs.

### Reference

VT

### Example

```
LPRINT CHR$(27);"B";CHR$(10);  
CHR$(20);CHR$(40);CHR$(0);
```

## Chapter 3. Control Codes

### ESC D

#### Expression

```
CHR$(27);"D";CHR$(n1);CHR$(n2);. . .  
CHR$(nK);CHR$(0 or 128);
```

#### Function

Sets horizontal tab stop positions.

#### Remarks

The following example shows horizontal tab stop positions set at printer column positions of 10, 20 and 40. They are followed by CHR\$(0) or CHR\$(128), the NUL codes. They must also be in numerical order.

Tab stops between 1 and 80 can be set. When the printer is in condensed print mode, tab stops up to 132 can be set. The maximum number of horizontal tabs is 28.

The HT code is used to execute a tab operation.

ESC D followed only by NUL cancels tab stops.

#### Reference

HT

#### Example

```
LPRINT CHR$(27);"D";CHR$(10);  
CHR$(20);CHR$(40);CHR$(0);
```

# Format Control

---

## NUL

### Expression

`CHR$(0);`

or

`CHR$(128);`

### Function

This code is used with ESC B and ESC D as a list terminator. NUL is also used with other printer control codes to select options (e.g., ESC S).

### Reference

ESC B, ESC D

### Example

`LPRINT CHR$(0);`

or

`LPRINT CHR$(128);`

## Chapter 3. Control Codes

### ESC C

#### Expression

Number of lines specified:

```
CHR$(27);"C";CHR$(n);  
(1 ≤ n ≤ 127)
```

Inches specified:

```
CHR$(27);"C";CHR$(0);CHR$(n);  
(1 ≤ n ≤ 22)
```

#### Function

Sets form length.

#### Remarks

The ESC C (n)<sub>D</sub> code changes the form length by n number of lines. The form length is one line multiplied by n (lines).

ESC C (0)<sub>D</sub>(n)<sub>D</sub> code sets the form length in inches. The form length is n inches.



# Format Control

---

## Example 1

Set the form length to 50 lines:

```
LPRINT CHR$(27);"C";CHR$(50);
```

## Example 2

```
10 LPRINT CHR$(27);"C";CHR$(0);CHR$(1);
20 LPRINT "Dear Sirs,";
30 LPRINT CHR$(12);
40 LPRINT "etc.";
```

Dear Sirs,

etc.

## Chapter 3. Control Codes

### NOTES:

1. The printer designates the position on the page when the code is input as the top-of-form position.
2. Form feed, skip-over perforation, etc. are carried out according to the form length set by this code.
3. The form length is stored as an absolute length. Therefore, the specified form length will not change after it has been set, even if the line spacing is changed.

# Format Control

## ESC N

### Expression

```
CHR$(27);"N";CHR$(n)  
(1 ≤ n ≤ 127)
```

### Function

Sets skip-over perforation.

### Remarks

The ESC N code is used to set the skip-over perforation function, which specifies the number of lines (n) to be skipped at the bottom of a form.

For example, if you are using 11-inch paper and you set a skip-over perforation of 6 lines, the printer prints 60 lines from the top-of-form position, feeds 6 lines, and then continues printing the 61st line of data at the top-of-form position of the next page.

When the form length is changed by using the ESC C code again, any skip-over perforation specified is cancelled. ESC N must be input again to set the amount of skip-over perforation.

When the switch pin 2-4 is ON, 1-inch skip-over perforation is executed. A skip-over perforation setting with a value that exceeds the length of the form is ignored.

### Reference

ESC O, ESC C

## Chapter 3. Control Codes

### Example

```
10 'Skip-over Perforation
20 LPRINT CHR$(27);"C";CHR$(5);
30 LPRINT CHR$(27);"N";CHR$(2);
40 FOR I=1 TO 9
50 LPRINT "Let's count      ";I
60 NEXT
70 END
```

```
Let's count      1
Let's count      2
Let's count      3
```

```
Let's count      4
Let's count      5
Let's count      6
```

```
Let's count      7
Let's count      8
Let's count      9
```

# Format Control

## ESC O

### Expression

```
CHR$(27);"O";
```

### Function

Cancels skip-over perforation.

### Remarks

This code cancels the skip-over perforation set by the ESC N code.

### Reference

ESC N

### Example

```
10 Skip-over Perforation Cancel
20 LPRINT CHR$(27);"C";CHR$(3);
30 LPRINT CHR$(27);"N";CHR$(2);
40 LPRINT "Twinkle twinkle"
50 LPRINT "    little star"
60 LPRINT "  *! *! *! *! *! *! "
70 LPRINT CHR$(27);"O";
80 LPRINT "Twinkle twinkle"
90 LPRINT "    little star"
100 LPRINT "  *! *! *! *! *! *! "
```

## Chapter 3. Control Codes

Twinkle twinkle

little star

\*! \*! \*! \*! \*! \*!

Twinkle twinkle

little star

\*! \*! \*! \*! \*! \*!



# Format Control

## ESC Q

### Expression

```
CHR$(27);"Q";CHR$(n);
```

### Function

Sets column end.

### Remarks

This code changes the right margin. The length from the left end of the column to the right end is the character width (character size) multiplied by n. This code must be specified at the beginning of a line.

If this code is not specified at the beginning of a line, print data preceding this code may be lost.

The maximum and minimum values for n in each print mode are listed below. If their range is exceeded, n is ignored and the previous setting remains in effect.

$2 \leq n \leq 80$  Pica-sized mode and Emphasized mode  
 $4 \leq n \leq 137$  Condensed mode  
 $3 \leq n \leq 96$  Elite-sized mode

When the enlarged print mode is set, n for each mode is half of each value listed.

### Reference

ESC /

## Chapter 3. Control Codes

### Example

```
10 LPRINT CHR$(27);"Q";CHR$(15);  
20 LPRINT "123456789012345678901234567890"  
30 END
```

```
123456789012345  
678901234567890
```

#### NOTE:

If the right or left margin is not specified, the buffer-full position in condensed mode is set to 132 columns (5 characters less than normal mode). However, when the right or left margin is set by the ESC Q or ESC / code, condensed characters are printed up to the specified print column width in the same manner as in pica-sized character mode.

For details, refer to "Buffer Column Widths" on page 3-4.

# Format Control

## ESC /

### Expression

```
CHR$(27);"I";CHR$(n);
```

### Function

Sets column head.

### Remarks

This code sets the position of the column head in the current character size.

$0 \leq n \leq 78$	Pica-sized mode and Emphasized mode
$0 \leq n \leq 134$	Condensed mode
$0 \leq n \leq 93$	Elite-sized mode

### Reference

ESC Q

### Example 1

To set the left margin to the 8th column:

```
10 'Left Margin
20 LPRINT "01234567890123456789"
30 LPRINT CHR$(27);"I";CHR$(8);
40 LPRINT
50 LPRINT "The Message from SPERRY."
```

01234567890123456789

The Message from SPERRY.

## Chapter 3. Control Codes

### Example 2

```
10 'Horizontal TAB & ESC I
20 GOSUB 100
30 LPRINT CHR$(27);"I";CHR$(15);
40 GOSUB 100
50 END
100 LPRINT "01234567890123456890"
110 LPRINT CHR$(27);"e";CHR$(0);CHR$(5);
120 LPRINT "TAB";CHR$(9);"TAB";
130 LPRINT CHR$(9);CHR$(9);"TAB";
140 RETURN
```

```
012345678901234567890
TAB  TAB          TAB
          012345678901234567890
          TAB  TAB          TAB
```

#### NOTE:

ESC I clears the horizontal tab positions previously set. Subsequent horizontal tab settings are carried out if the start column position set by the ESC I is position 0.

# Input Data Control

## Input data control

### DEL

#### Expression

`CHR$(127);`

#### Function

Cancels last printable data.

#### Remarks

The DEL code deletes the last printable data stored in the print buffer.

This code is ignored in the bit image mode.

#### Reference

BS

#### Example 1

```
10 'Delete Ex.1
20 LPRINT "Delete";
30 LPRINT CHR$(127);
40 LPRINT "ing"
```

Deleting

## Chapter 3. Control Codes

### Example 2

```
10 'Delete Ex.2
20 LPRINT "DELETE";
30 LPRINT CHR$(127);CHR$(127);CHR$(127);
```

DEL



# Input Data Control

---

## CAN

### Expression

CHR\$(24);

### Function

Clears printer buffer.

### Remarks

Control codes, except SO, remain in effect.

### Example

LPRINT CHR\$(24);

## Chapter 3. Control Codes

### Miscellaneous

### BEL

#### Expression

```
CHR$(7);
```

#### Function

Sounds the alarm.

#### Remarks

The BEL code causes the printer alarm to sound for approximately 0.2 second.

#### Example

```
LPRINT CHR$(7);
```

#### NOTE:

To disable the alarm, set switch pin 1–3 to the ON position.

# Miscellaneous

## ESC 8

### Expression

`CHR$(27);"8";`

### Function

Ignores paper-end detector.

### Remarks

This code enables the printer to print data to the last line of the last sheet of paper.

If switch pin 1–5 is set to the ON position when you turn the power on, the printer is in the ESC 8 condition.

### Reference

ESC 9

#### NOTE:

If the ESC 8 code is transferred after the printer is out of paper, the paper-end error cannot be released.

# Chapter 3. Control Codes

## ESC 9

### Expression

`CHR$(27);"9";`

### Function

Enables paper-end detector.

### Remarks

This code cancels the ESC 8 condition. If there is no paper in the printer, it goes offline. (In this case, insert paper in the printer and press the ON LINE switch to resume printing.) If switch pin 1-5 is set to the OFF position when you turn on the power, the printer is in the ESC 9 condition.

### Reference

ESC 8

# Miscellaneous

## ESC <

### Expression

```
CHR$(27); "<"
```

### Function

Prints only the current line from left to right.

### Remarks

This code returns the printhead to its leftmost position so that data is printed from left to right for one line.

### Reference

ESC U

### Example

```
10 'Let's see ESC <
20 LPRINT "      "Ah, well."
30 LPRINT CHR$(27); "<"
```

Ah, well.

### NOTE:

ESC < causes the printhead to return to its leftmost position only once, while ESC U causes print data to be printed unidirectionally. Using these two commands is recommended for greater print precision.

## Chapter 3. Control Codes

### ESC @

#### Expression

```
CHR$(27);"@";
```

#### Function

Initializes the printer.

#### Remarks

The printer is initialized and all data in the print buffer is cleared.



# Miscellaneous

## ESC U

### Expression

`CHR$(27);"U";CHR$(n);`

`n = 1 or 49`      Unidirectional printing

`n = or 48`      Bidirectional printing (except in bit image mode)

### Function

Sets/cancels unidirectional printing.

### Remarks

1. Unidirectional printing (`n = 1 or 49`). `ESC U (1)D` or `ESC U (49)D` causes all data following this code to be printed only when the printhead is moving unidirectionally from left to right. Unidirectional printing improves the precision of vertical character alignment.
2. Bidirectional printing (`n = 0 or 48`). `ESC U (0)D` or `ESC U (48)D` cancels the unidirectional print mode. The printer returns to the normal bidirectional print mode.

### Reference

ESC <

## Chapter 3. Control Codes

### Example

```
10 LPRINT "Let's see."  
20 LPRINT CHR$(27);"U";CHR$(1);  
30 LPRINT "Let's see."  
40 LPRINT CHR$(27);"U";CHR$(0);  
50 LPRINT "Let's see."  
60 END
```

```
Let's see.  
Let's see.  
Let's see.
```

# Miscellaneous

---

## ESC s

### Expression

`CHR$(27);"s";CHR$(n);`

`n = 1 or 49`: Sets half-speed printing

`n = 0 or 48`: Cancels half-speed printing

### Function

Sets/cancels half-speed printing.

### Remarks

1. Sets half-speed printing (`n = 1 or 49`) `ESC s (1)D` or `ESC s (49)D` decreases the print speed from normal 100 cps (character per second) to 50 cps. This reduces print noise.
2. Cancels half-speed printing (`n = 0 or 48`). `ESC s (0)D` or `ESC s (48)D` returns the print speed to normal 100 cps.

## Chapter 3. Control Codes

### Control Codes in Bit Image Mode

The bit image mode is set by the following codes:

- ESC K
- ESC L
- ESC Y
- ESC Z
- ESC \*

Once the bit image mode is entered, all the data is recognized as bit-image data until the specified number of data bytes is received (specified by  $n_1$  and  $n_2$  described later). After a specified number of data bytes is received, the printer returns to text mode.

# Control Codes in Bit Image Mode

## ESC K

### Expression

`CHR$(27);"K";CHR$(n1);CHR$(n2);  
CHR$(d1);CHR$(d2);...CHR$(dnn, n2)`    ⌈BIT-IMAGE DATA

### Function

Sets normal-density bit image mode. (The maximum number of bit-image data bytes per line is 480.)

### Remarks

Data following ESC K code is printed as bit-image data.

### Reference

ESC L, ESC Y, ESC Z, ESC \*

## Chapter 3. Control Codes

### How to Obtain $n_1$ and $n_2$

The number of bit-image data bytes is sent in hexadecimal numbers  $n_1$  and  $n_2$ .

As shown in the following examples, if the number of bit-image data bytes is 300, it is converted to a 16-bit hexadecimal number. (The least significant bits are  $n_1$  and the most significant bits are  $n_2$ .)

#### Example 1

$$\begin{aligned}n_2 &= \text{INT}(\text{number of data bytes}/256) \\&= \text{INT}(300/256) \\&= (1)_D \\&= <01>_H\end{aligned}$$

#### Example 2

$$\begin{aligned}n_1 &= \text{Remainder of } n_2 \\&= (44)_D \\&= <2C>_H\end{aligned}$$

$n_1$  is the remainder of 300 divided by 256, and  $n_2$  is the quotient of 300 divided by 256.

In normal-density bit image mode, the maximum number of printable dot positions per line is 480. Therefore, if values of  $n_1$  and  $n_2$  are greater than 480 dot positions, they are ignored. Printing of bit-image data after the 480th dot position is not guaranteed.

It is possible to combine text data and bit-image data on the same line. When both are mixed on a line, the amount of printable bit-image data decreases due to printing in text mode.



## Control Codes in Bit Image Mode

Print Mode	No. of Bit-Image Data Decrease Per Char.
Pica-sized, Emphasized	6
Condensed	3.5
Elite-sized	5

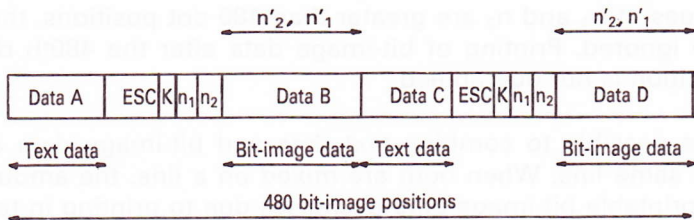
(When the enlarged print mode is set, the decrease in the amount of bit-image data printable per character of text mode is twice the above amounts.)

The number of bit-image data printable on a line by the ESC K code after 3 condensed and 1 pica-sized characters are printed is 463 ( $480 - (3.5 \times 3) + 6 \times 1$ ). (Fraction is rounded off.)

<b>3 condensed characters</b>	<b>1 pica-sized character</b>	<b>ESC</b>	<b>K</b>	<b>Bit-image data</b>
$3.5 \times 3$	$6 \times 1$			463 max.

Tot. 480

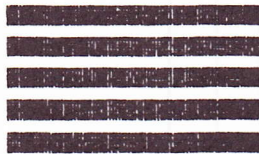
The following operation uses both text mode and bit image mode on a line:



## Chapter 3. Control Codes

To check for proper conversion to the normal-density bit image mode, execute the following program:

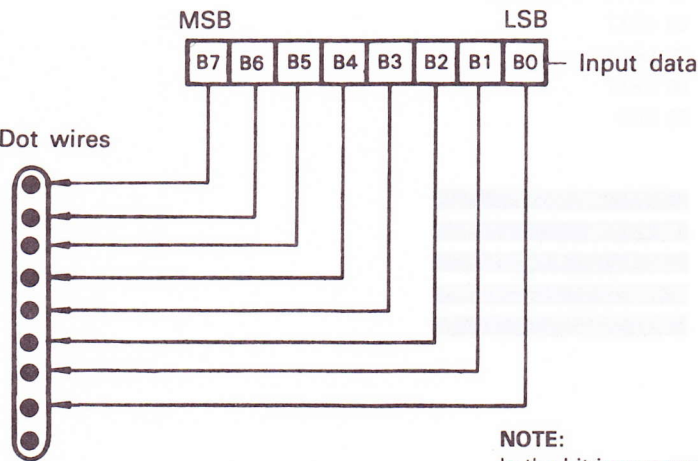
```
10 'Normal-density Bit Image Mode
20 FOR I=1 TO 5
30 LPRINT CHR$(27);"K";CHR$(80);CHR$(0);
40 FOR N=1 TO 80
50 LPRINT CHR$(255);
60 NEXT
70 LPRINT
80 NEXT
90 END
```



# Control Codes in Bit Image Mode

## Relationship Between Bit-Image Data and Dot Wires

The following figure shows the relationship between the bit-image data and the dot wires in the printhead. You can arbitrarily control the eight dot wires in the printhead.



**NOTE:**  
In the bit image mode,  
the 9th dot wire cannot  
be used.

## Chapter 3. Control Codes

If a bit is 1, the printhead fires. If a bit is 0, the printhead does not fire. For example, assume that data are given as follows:

	B7=0		B7=0
	B6=0	●	B6=1
●	B5=1		B5=0
	B4=0	●	B4=1
	B3=0		B3=0
	B2=0		B2=0
●	B1=1		B1=0
	B0=0		B0=0
(34)D		(80)D	

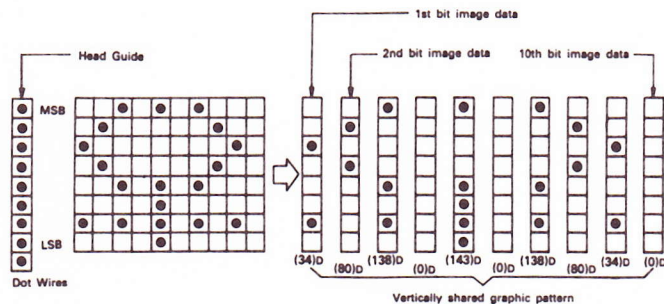
A box with ● denotes bit 1; a blank box denotes bit 0.

# Control Codes in Bit Image Mode

## Example 1

An example of a program used to print graphic data follows.

```
10 'Bit-Image Printing (Normal density)
20 LPRINT CHR$(27);"K";CHR$(10);CHR$(0);
30 FOR I=1 TO 10
40 READ R
50 LPRINT CHR$(R);
60 NEXT
70 LPRINT
80 DATA 34,80,138,0,143,0,138,80,34,0
90 END
```



### NOTE:

The most significant bit (MSB) of the bit-image data corresponds to the dot wire at the uppermost position.

## Chapter 3. Control Codes

This program has been developed using standard BASIC language. If extended BASIC is to be used, the program must be changed according to the features of the language.

If data is to be transferred through a BASIC interpreter, the transfer rate is extremely slow. In such a case, it is recommended that you transfer data through the machine language.

### Example 2

```
10 'Bit-Image Printing (Normal density)
20 LPRINT CHR$(27);"K";CHR$(12);CHR$(0);
30 FOR I=1 TO 12
40 READ R
50 LPRINT CHR$(R);
60 NEXT
70 LPRINT
80 DATA 4,10,26,58,103,231
90 DATA 231,103,58,26,10,4
100 END
```





# Control Codes in Bit Image Mode

Examples of brightness and dot density expressions using the bit image mode:

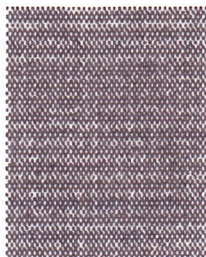
Expression of brightness



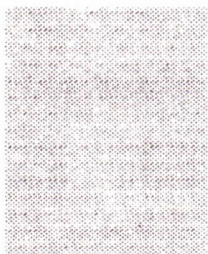
1



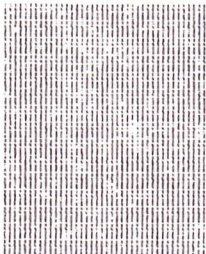
2



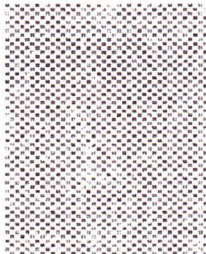
3



4



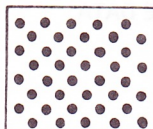
5



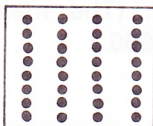
6

## Chapter 3. Control Codes

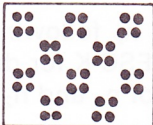
Expression of dot density



Data will be transmitted in order of  
(170)<sub>D</sub> and then (85)<sub>D</sub>  
(8-dot line spacing)



Data will be transmitted in order of  
(255)<sub>D</sub> and then (0)<sub>D</sub>  
(8-dot line spacing)



Data will be transmitted in order of two  
(204)<sub>D</sub> and then two (51)<sub>D</sub>  
(8-dot line spacing)

# Control Codes in Bit Image Mode

## ESC L

### Expression

`CHR$(27);"L";CHR$(n1);CHR$(n2);  
CHR$(d1);CHR$(d2);...CHR$(dn1, n2)`    <BIT-IMAGE DATA

### Function

Sets dual-density bit image mode. (The maximum number of bit-image data per line is 960.)

### Remarks

The dot pattern indicated by  $n_1$  and  $n_2$  following ESC L is printed in dual-density. Refer to ESC K for detailed information on obtaining the values of  $n_1$  and  $n_2$ .

The transfer sequence of bit-image data is the same as with ESC K (normal-density bit-image printing), but bit-image data can be printed in 960 dot positions per line, thus producing denser graphic data. If data greater than this amount is specified, the excess is ignored.

After the bit-image printing is completed, the printer automatically returns to text mode.

You can combine normal-density bit image with dual-density bit image on a line with characters in text mode. When characters in the text mode and dual-density bit image mode are mixed, the amount of printable bit-image data decreases twice the amount of normal-density bit image (ESC K).

## Chapter 3. Control Codes

---

The print speed decreases from the normal 10 ips (inches per second) to 5 ips. For example, the number of bit-image data bytes printable on a line by the ESC L code after 3 condensed and 1 pica-sized characters are printed is 927 ( $960 - (2 \times (3.5 \times 3 + 6 \times 1))$ ).

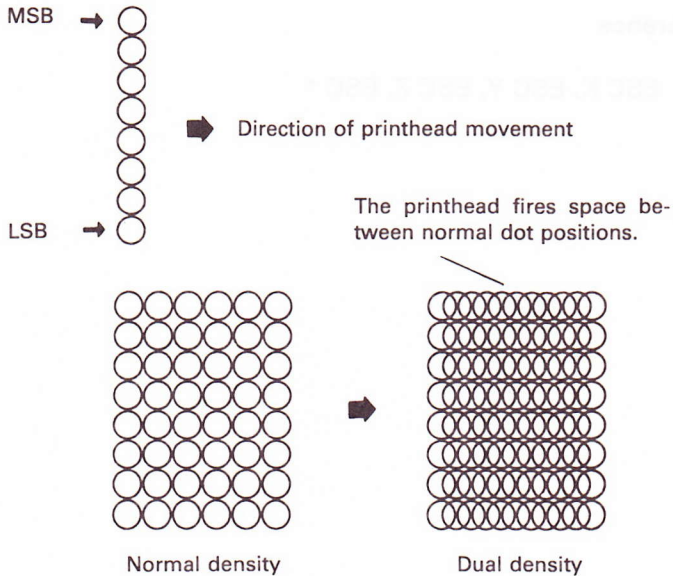
### Reference

ESC K, ESC Y, ESC Z, ESC \*

# Control Codes in Bit Image Mode

## Difference Between ESC K and ESC L

The normal-density mode is accessed with ESC K. The dual-density mode is accessed with ESC L.



## Chapter 3. Control Codes

### Example 1

```
10 'Dual-density Bit Image Mode
20 FOR I=1 TO 5
30 LPRINT CHR$(27);"L";CHR$(80);CHR$(0);
40 FOR N=1 TO 80
50 LPRINT CHR$(255);
60 NEXT
70 LPRINT
80 NEXT
90 END
```



### Example 2

```
10 'Dual-density Bit Image Mode
20 LPRINT CHR$(27);"L";CHR$(10);CHR$(0);
30 FOR I=1 TO 10
40 READ R
50 LPRINT CHR$(R);
60 NEXT
70 DATA 34,80,138,0,143,0,138,80,34,0
80 END
```

♀



# Control Codes in Bit Image Mode

---

## ESC Y

### Expression

`CHR$(27);"Y";CHR$(n1);CHR$(n2);  
CHR$(d1);CHR$(d2);...CHR$(dn1, n2)`    ⚡BIT-IMAGE DATA

### Function

Sets double-speed, dual-density bit image mode. (The maximum number of bit-image data per line is 960.)

### Remarks

When ESC L is entered, the print speed decreases from the normal 10 ips (inches per second) to 5 ips. If ESC Y is used, however, normal print speed is enabled and bit-image data of 960-position/8 inch is printed. Horizontally adjacent dots cannot be printed.

To obtain  $n_1$  and  $n_2$ , refer to ESC K.

### Reference

ESC K, ESC L, ESC Z, ESC \*

## Chapter 3. Control Codes

### ESC Z

#### Expression

`CHR$(27);"Z";CHR$(n1);CHR$(n2);`  
`CHR$(d1);CHR$(d2);...CHR$(dn1, n2)`    ⚡BIT-IMAGE DATA

#### Function

Sets quadruple-density bit image mode. (The number of bit-image data per line is 1,920.)

#### Remarks

Horizontally adjacent dots cannot be printed in this mode.

To obtain the values of  $n_1$  and  $n_2$ , refer to ESC K.

The print speed is 5 ips (inches per second), the same as that of dual-density bit image mode (ESC L).

#### Reference

ESC K, ESC L, ESC Y, ESC \*

# Control Codes in Bit Image Mode

## ESC \*

### Expression

```
CHR$(27); "*" ; CHR$(m); CHR$(n1); CHR$(n2);  
CHR$(d1); CHR$(d2); ... CHR$(dn1, n2)  ⚡BIT-IMAGE DATA
```

### Function

This code selects bit-image mode.

m	Mode	Max. Position/8 in.	Head Speed (in./sec.)	Code With Same Function
0	Normal density	480	10	ESC K
1	Dual-density	960	5	ESC L
2	Double-speed, dual-density	960	10	ESC Y
3	Quadruple-density	1920	5	ESC Z
4	CRT graphics	640	5	—
6	CRT graphics II	720	5	—

### Remarks

To obtain  $n_1$  and  $n_2$ , refer to ESC K. If the value specified for  $m$  is not in the range 0 to 4 or 6, the number of data specified is ignored.

When  $m$  is 2 or 3, horizontally adjacent dots are not printed. To print screen (CRT) data,  $m=4$  is optimal.

## Chapter 3. Control Codes

```
10 LPRINT CHR$(27);""(0);CHR$(0);CHR$(1);
20 FOR I=1 TO 256; LPRINT "x";: NEXT
30 LPRINT "END"
```

is the same as:

```
10 LPRINT CHR$(27);"K";CHR$(0);CHR$(1);
20 FOR I=1 TO 256; LPRINT "x";:NEXT
30 LPRINT "END"
```

### Reference

ESC K, ESC L, ESC Y, ESC Z

### Example 1

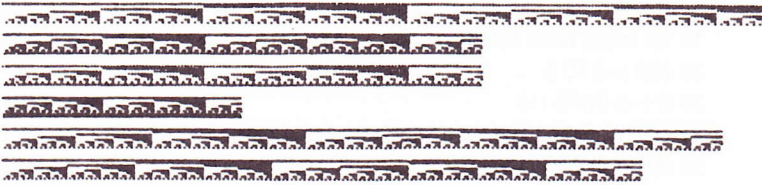
```
10 'Bit Image Mode Selection
20 FOR I=0 TO 6
30 IF I=5 GOTO 110
40 LPRINT CHR$(27);""(I);CHR$(12);CHR$(0);
50 FOR J=1 TO 12
60 READ R
70 LPRINT CHR$(R);
80 NEXT J
90 DATA 1,3,7,15,31,63,63,31,15,7,3,1
100 RESTORE
110 NEXT I
120 END
```



# Control Codes in Bit Image Mode

## Example 2

```
10 'Bit Image Mode Selection
15 D=300
20 FOR I=0 TO 6
30 IF I=5 GOTO 90
40 LPRINT CHR$(27);"*";CHR$(I);
50 LPRINT CHR$(D MOD 256);CHR$(INT (D/256));
60 FOR J=0 TO D
70 LPRINT CHR$(J MOD 128+128);
80 NEXT J
90 LPRINT
100 NEXT I
110 END
```





## Chapter 4. Maintenance

Cleaning ..... 4-1

Parts Replacement ..... 4-2

General ..... 4-2

Printhead ..... 4-2





# Chapter 4. Maintenance

## Cleaning

Clean the printer every three months with a soft brush to remove paper dust and particles. The exterior of the printer can be cleaned with a mild detergent and water solution.

### NOTE:

To avoid damaging the printhead, do not use a rough cloth or harsh solvents (such as thinner or alcohol).

# Parts Replacement

## Parts Replacement

### General

Because the printer mechanism is sophisticated, operator troubleshooting of mechanical problems is limited. If a printer malfunctions and the problem is not related to the printhead, contact your Sperry representative.

### Printhead Replacement

If your printhead malfunctions or a print dot wire is worn, replace the printhead unit as follows:

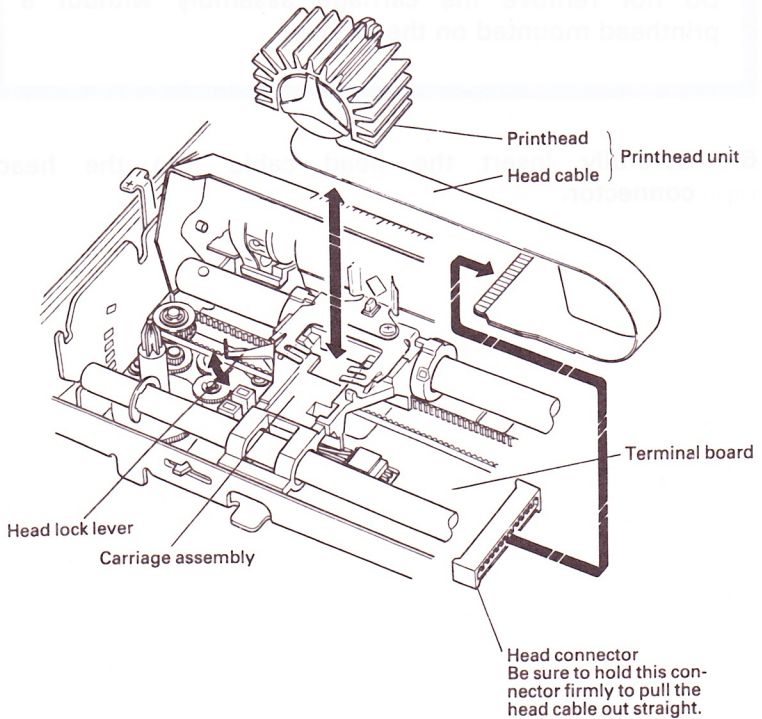
1. Disconnect the printer power cord from the outlet.
2. Remove the printer lid and ribbon cartridge.

#### NOTE:

Be sure the printhead has cooled before you to remove it.

## Chapter 4. Maintenance

3. Turn the head lock lever clockwise and remove the printhead.
4. Pull the head cable straight out while steadying the head connector on the terminal board.



# Printhead Replacement

5. Put a new printhead on the carriage assembly and lock it in place using the head lock lever.

## NOTE:

Do not remove the carriage assembly without a printhead mounted on the carriage.

6. Carefully insert the head cable into the head connector.



# Appendixes

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# Appendix A. Specifications

## Specifications

1. Print Method: Impact dot matrix
2. Print Speed: 100 cps
3. Print Direction:
  - Text mode: Bidirectional
  - Bit image/  
Superscript/subscript/  
Programmed: Unidirectional
4. Pins in Head: 9
5. Line Spacing: 1/6 in. or programmable
6. Printing Characteristics:
  - Matrix: 9x9  
6x8 Graphic characters
  - Character set: 96 ASCII  
41 International  
32 Control  
37 Symbol  
50 Graphic
7. Character Size (Width x Height):
  - Pica-sized/Emphasized/  
Condensed enlarged: 2.1 x 3.1 mm
  - Pica-sized condensed: 1.05 x 3.1 mm
  - Pica-sized enlarged/  
Emphasized enlarged: 4.2 x 3.1 mm
  - Elite-sized: 1.5 x 3.1 mm
  - Elite-sized enlarged: 3.0 x 3.1 mm
  - Superscript/subscript: 1.6 mm (height)

# Specifications

## 8. Column Width (max. characters per line):

Pica-sized/Emphasized:	80
Enlarged:	40
Condensed:	137
Condensed enlarged:	68
Elite-sized:	96
Elite-sized enlarged:	48

## 9. Media Handling:

Fanfold paper:	101.6 to 245 mm (4 to 10 in.) wide
Paper feed:	Tractor feed
Copies (original and two carbons):	Up to 0.3 mm (0.012 in.)
Paper path:	Rear

## 10. Interface:

Centronics\*-style  
(8-bit parallel)

## 11. Ink Ribbon:

Color:	Black
Type:	Exclusive cartridge
Life expectancy:	3 million characters

## 12. Environmental Conditions:

Temperature:	5° to 35° C (41° to 95° F)
Humidity:	10% to 80% (no condensation)

## 13. Power Requirements:

Voltage:	AC 120V $\pm$ 10% AC 220/240V $\pm$ 10%
Frequency:	49.5 to 60.5 Hz
Power Consumption:	70 VA max.

*\*Centronics is a trademark of Centronics Data Computer Corporation.*

## Appendix A. Specifications

### 14. Physical Characteristics:

Height:	107 mm
Width (without paper feed knob):	372 mm
Depth:	303 mm
Weight:	5.1 kg

#### NOTE:

Specifications are subject to change without notice.





## Appendix B. Parallel Interface

The Model 5 includes a parallel interface, which is described below.

### Specifications

1. Synchronization: Externally supplied STROBE pulses.
2. Handshaking: ACKNLG or BUSY signals.
3. Logic level: Input data and interface control signals compatible with the TTL level. (Compatible with Centronics-style 8-bit parallel)

### Connector

Plug: 57-30360 (AMPHENOL)

Interface cables should be as short as possible.

# Signal Descriptions

---

## Connector Pin Numbers and Descriptions of Signals

In the following table, direction refers to the direction of signal flow from the printer. Return means TWISTED PAIR RETURN and is to be connected at signal ground level. To wire the interface, use a twisted-pair cable for each signal and complete connection on the return side. To prevent noise, shield these cables and connect them to the chassis of the host computer and the printer, respectively.

Interface conditions are based on TTL level. The rise and fall times of each signal must be less than 0.2  $\mu$ s.

Transfer data to the printer only after confirming the ACKNLG signal or when the level of the BUSY signal is LOW.

Under normal conditions, printer cable pins 11, 12 and 32 are activated when out-of-paper is detected. ESC 8 code disables pins 11 and 32 from the PE (paper-end) signal, but does not disable pin 12.

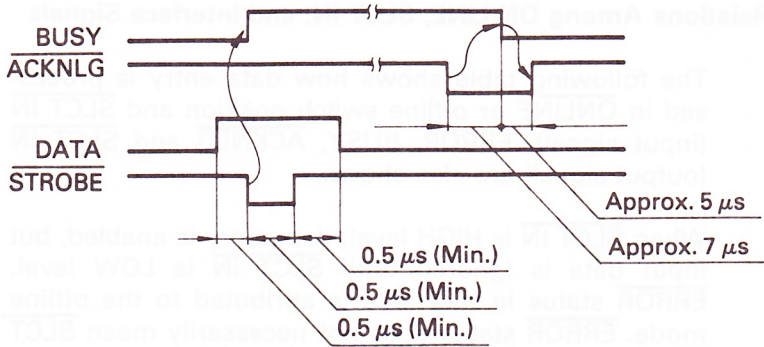
## Appendix B. Parallel Interface

Signal Pin No.	Return Pin No.	Signal	Direction	Description
1	19	<u>STROBE</u>	In	<u>STROBE</u> pulse to read data in. Pulse must be wider than 0.5 $\mu$ s at receiving terminal.
2	20	DATA 1	In	These signals represent the 1st to 8th bits of parallel data respectively. Each signal is at HIGH level when data is logical "1" and LOW when data is at logical "0"
3	21	DATA 2	In	
4	22	DATA 3	In	
5	23	DATA 4	In	
6	24	DATA 5	In	
7	25	DATA 6	In	
8	26	DATA 7	In	
9	27	DATA 8	In	
10	28	<u>ACKNLG</u>	Out	Approx. 12 $\mu$ s pulse. LOW indicates data has been received and printer is ready to accept other data.
11	29	BUSY	Out	HIGH signal indicates that printer cannot receive data. Signal becomes HIGH in the following cases: 1. During data entry 2. During print operation 3. In offline state 4. During printer error
12	30	PE	Out	HIGH signal indicates that printer is out of paper.
13	—	—	—	Pulled up to +5V through 3.3 k $\Omega$ resistance.
14	—	<u>AUTO FEED XT</u>	In	With signal at LOW level, paper is automatically fed one line after printing. Signal level can be set to LOW with SW pin 2-3.)

# Signal Descriptions

Signal Pin No.	Return Pin No.	Signal	Direction	Description
15	—	NC	—	Not used.
16	—	0V	—	Logic GND level.
17	—	CHASSIS GND	—	Printer chassis GND. Chassis GND and the logic GND are isolated from each other.
18	—	NC	—	Not used.
19 to 30	—	GND	—	TWISTED-PAIR RETURN signal GND level.
31	—	INIT	In	When LOW, printer controller is reset to its initial state and print buffer is cleared. Signal is normally set at HIGH level and pulse width must be more than 50 $\mu$ s at receiving terminal.
32	—	<u>ERROR</u>	Out	Becomes LOW when the printer is: 1. Out of paper 2. Offline 3. In error state
33	—	GND	—	Same as Pins 19 to 30.
34	—	NC	—	Not used.
35	—	—	—	Pulled up to +5V through 3.3 k $\Omega$ resistance.
36	—	<u>SLCT IN</u>	In	Data entry to printer is possible only when level of this signal is LOW. (Can be set with SW pin 2-2.) Factory-set to LOW.

## Appendix B. Parallel Interface



**Parallel Interface Timing**

DATA ENTRY	ACKNLG	BUSY	STROBE	SELECT IN	ON LINE Switch
Disable	Not Generated	HIGH	LOW	HIGH/LOW	Online
Enable	Generated	LOW/HIGH	HIGH	HIGH	Offline
Enable (Normal Entry)	Generated	LOW/HIGH	HIGH	LOW	



# Signal Relationships

## Relations Among ON LINE, SLCT IN, and Interface Signals

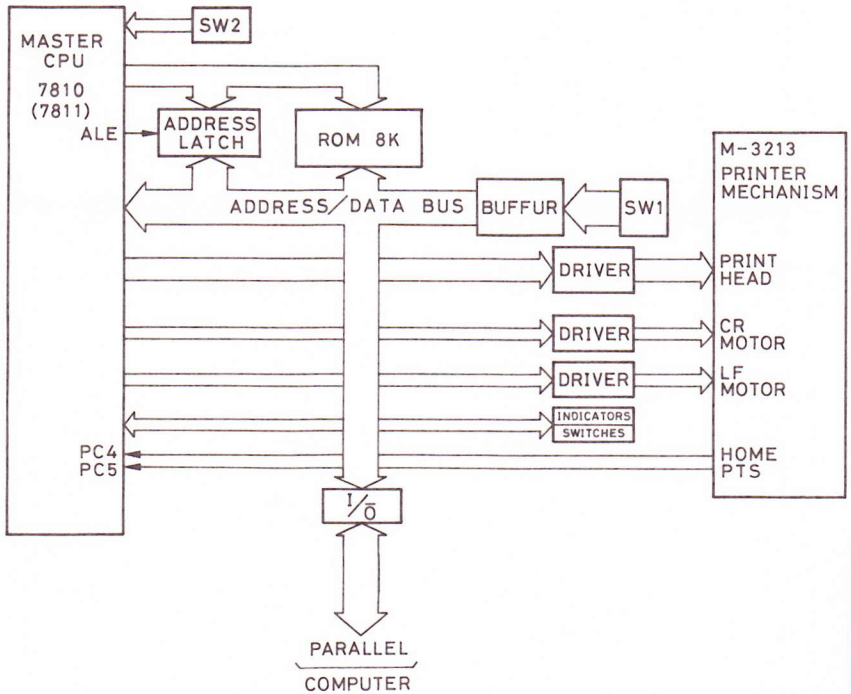
The following table shows how data entry is processed in ONLINE or offline switch position and SLCT IN (input signal). ERROR, BUSY, ACKNLG and SLCT IN (output signal) are also shown.

When SLCT IN is HIGH level, data entry is enabled, but input data is ignored until SLCT IN is LOW level. ERROR status in the table is attributed to the offline mode. ERROR status does not necessarily mean SLCT IN status.

ON LINE Switch	<u>SLCT IN</u> Signal	<u>ERROR</u>	<u>BUSY</u>	<u>ACKNLG</u>	DATA ENTRY
Offline	HIGH/LOW	LOW	HIGH	Not generated	Disable
Online	HIGH	HIGH	LOW/HIGH	Generated	Enable
	LOW	HIGH	LOW/HIGH	Generated	Enable (Normal entry)

## Appendix C. Control Circuit Diagram

The control circuit diagram is shown below:





## Appendix D. Mixed Use of Printing Modes

In the following table, ○ indicates that mixed print mode is available. The × indicates that pitch takes priority and mixed print mode is not available.

Emphasized mode takes priority over condensed mode and in superscript/subscript mode, the printer double-strikes characters.

Mode	Pica-sized Pitch	Elite-sized Pitch
Enlarged	○	○
Emphasized	○	×
Super/Subscript	○	○
Condensed	○	×
Double	○	○
Underline	○	○
Alternate	○	○
Unidirectional	○	○



# Appendix E. Character Set Tables

Character Set 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NUL							BEL		HT	LF		FF	CR	SO	SI
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		DC2		DC4				CAN			ESC				
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
SP	!		#	\$	%	&	'	(	)	*	+	,	—	•	/
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
‘	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
p	q	r	s	t	u	v	w	x	y	z	{		}	~	



# Character Set 1

128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
NUL							BEL		HT	LF		FF	CR	SO	SI
144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
		DC2		DC4				CAN			ESC				
160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
á	í	ó	ú	ñ	Ñ	ä	ö	ç	⌞	⌟	½	¼	ì	«	»
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
α	β	γ	π	Σ	σ	μ	τ	ϕ	θ	Ω	δ	∞	∅	€	∩
240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
≡	±	≥	≤	∫	ℳ	÷	≈	°	▪	-	√	∩	2	■	SP

# Appendix E. Character Set Tables

Character Set 2

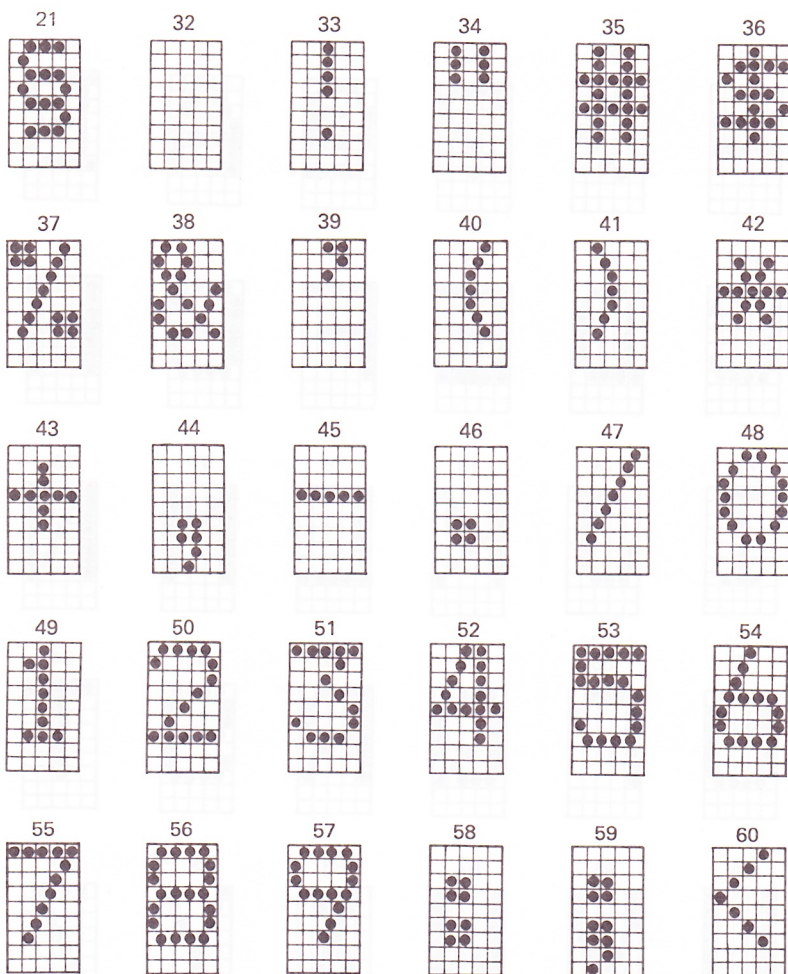
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NUL							BEL		HT	LF		FF	CR	SO	SI
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		DC2		DC4	§			CAN			ESC				
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
SP	!	¨	#	\$	%	&	'	(	)	*	+	,	—	•	/
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
‘	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
p	q	r	s	t	u	v	w	x	y	z	{		}	~	

# Character Set 2

## E. CHARACTER SETS

128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
ç	ü	é	â	ä	à	á	ç	ê	ë	è	ï	î	ì	Ä	Â
144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
É	æ	Æ	ø	ö	ò	û	ù	ÿ	ö	ü	¢	£	¥	℞	ƒ
160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
á	í	ó	ú	ñ	Ñ	ɡ	ŋ	¿	¬	½	¼	ì	«	»	
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒
192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒
208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒
224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
α	β	γ	π	Σ	σ	μ	τ	ϕ	θ	Ω	δ	∞	∅	€	∩
240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
≡	±	≥	≤	∫	∫	÷	≈	◦	▪	-	√	∩	2	■	SP

# Appendix F. Character Fonts

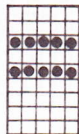


**NOTE:** Numbers represent Decimal code.



# Character Fonts

61



62



63



64



65



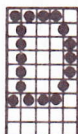
66



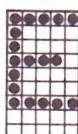
67



68



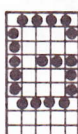
69



70



71



72



73



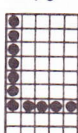
74



75



76



77



78



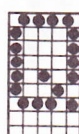
79



80



81



82



83



84



85



86



87



88



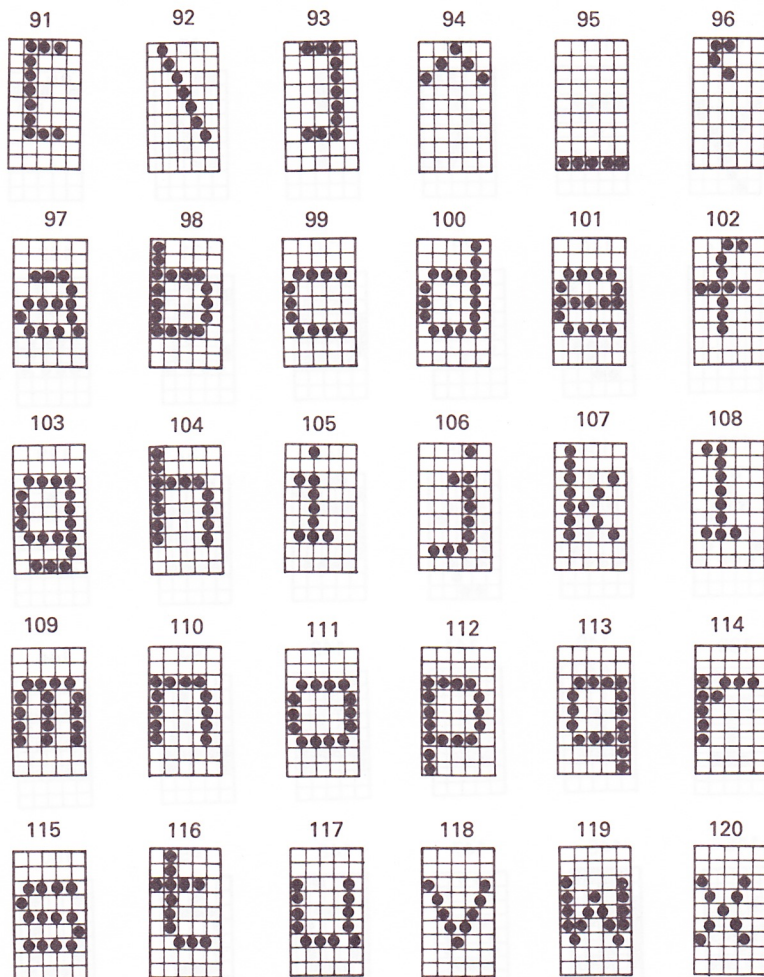
89



90

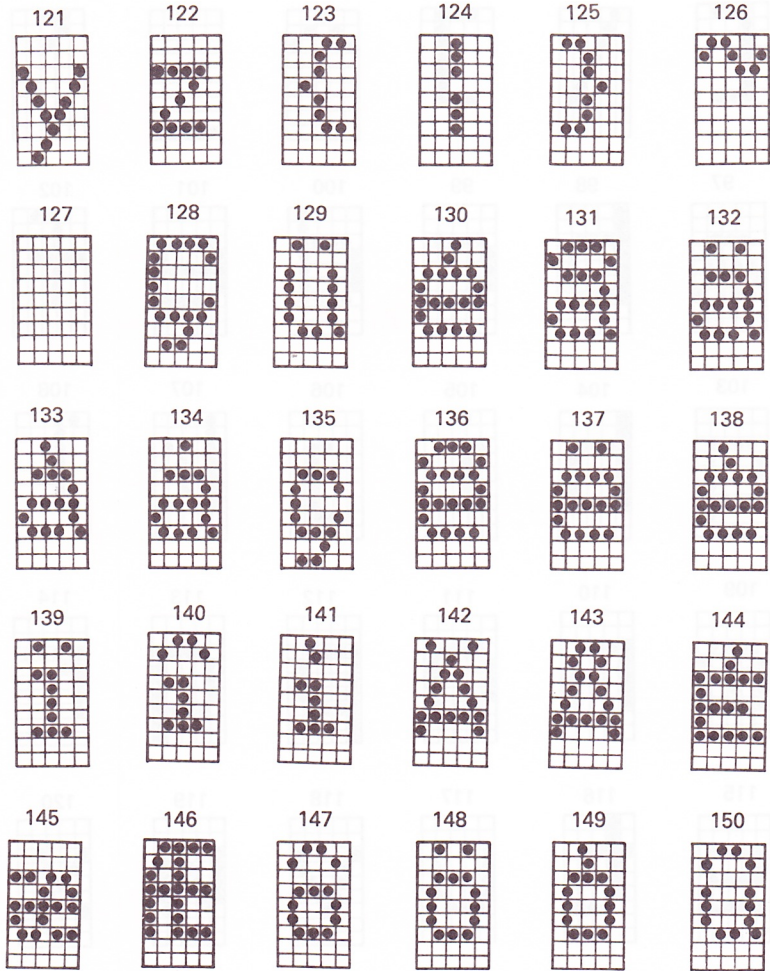


# Appendix F. Character Fonts

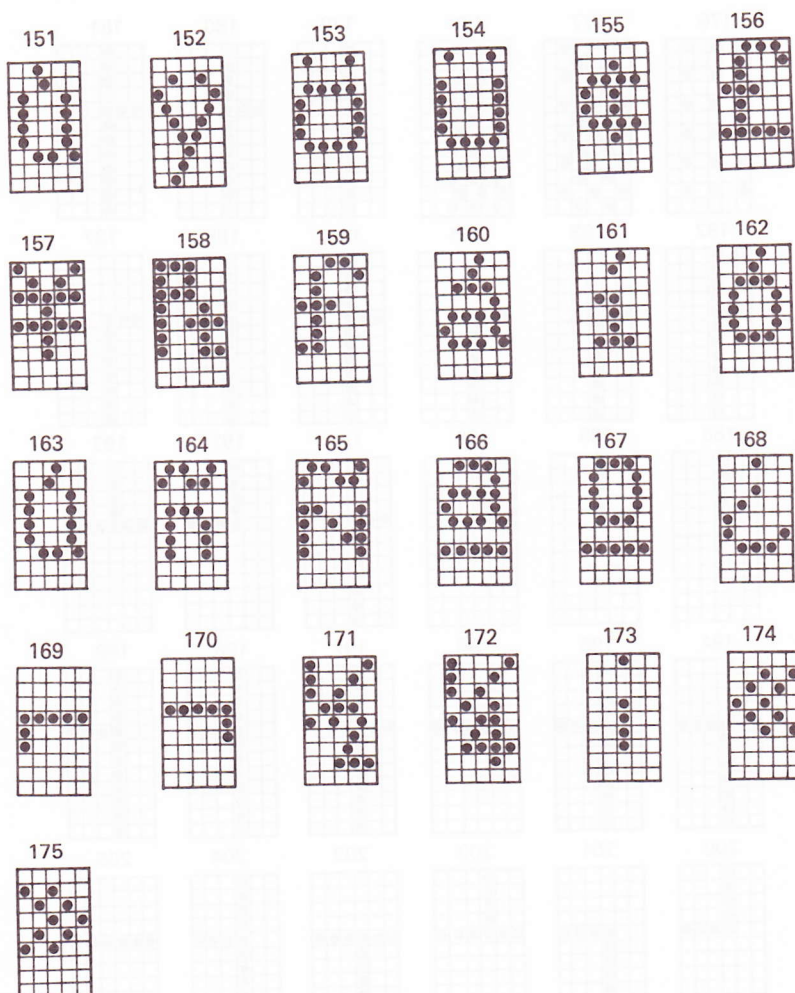




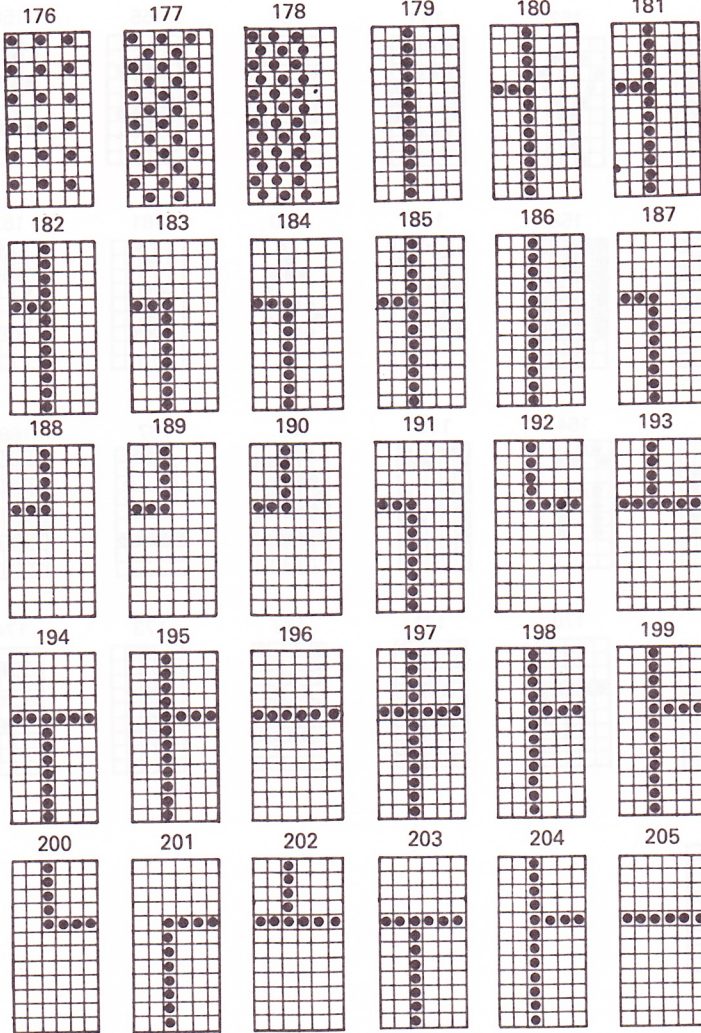
# Character Fonts



# Appendix F. Character Fonts

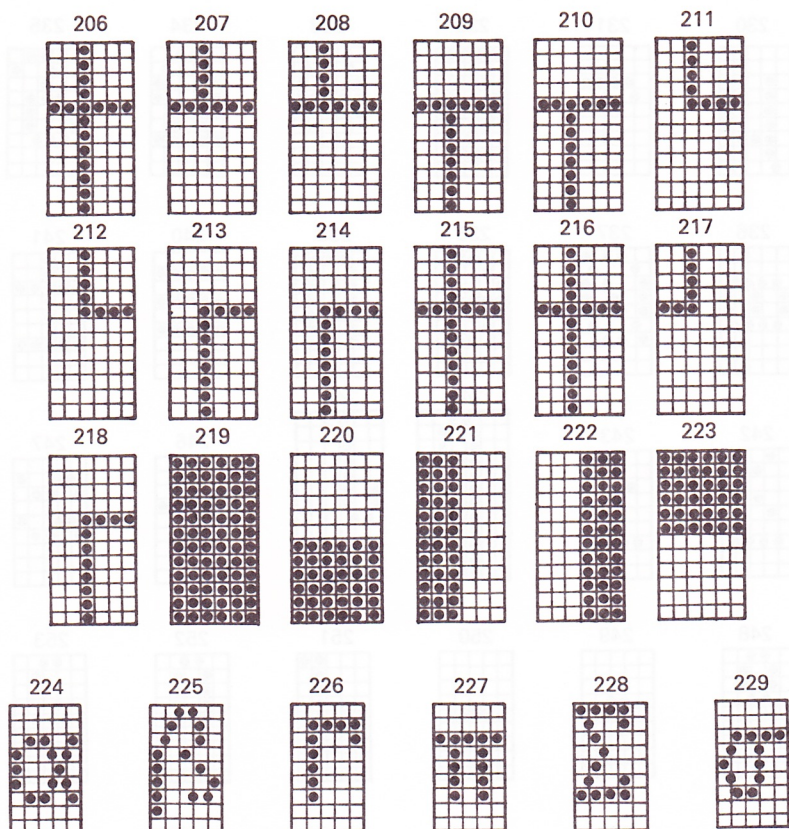


# Character Fonts



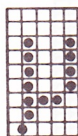


# Appendix F. Character Fonts



# Character Fonts

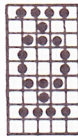
230



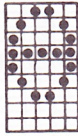
231



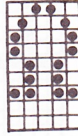
232



233



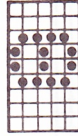
234



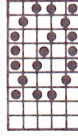
235



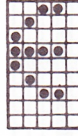
236



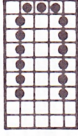
237



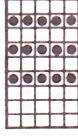
238



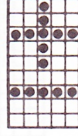
239



240



241



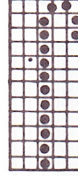
242



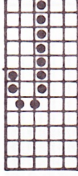
243



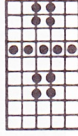
244



245



246



247



248



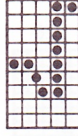
249



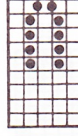
250



251



252



253



254



255



# Appendix G. Control Codes Summary

## Print Execution

Code	Function	Page
CR	Carriage Return.	3-7
LF	Line Feed.	3-8
ESC J	Tentative n/216 in. line spacing.	3-9
FF	Form Feed.	3-11

## Print Mode

Code	Function	Page
ESC M	Sets elite-sized character.	3-12
ESC P	Cancels ESC M code. Sets pica-sized character.	3-13
SO	Shift Out. Sets enlarged print mode.	3-14
DC4	Cancels enlarged print mode set by SO.	3-15
ESC W	Sets/cancels enlarged print mode.	3-16
SI	Shift In. Sets condensed print mode.	3-17
DC2	Cancels condensed print mode.	3-19
ESC -	Sets/cancels underlined print mode.	3-21
ESC E	Sets emphasized print mode.	3-22
ESC F	Cancels emphasized print mode.	3-23
ESC G	Sets double-strike print mode.	3-24
ESC H	Cancels double-strike print mode.	3-25
ESC S	Sets superscript/subscript print mode.	3-26
ESC T	Cancels superscript/subscript print mode.	3-29
BS	Backspace. Prints and backs up one character.	3-30

## Character Set Selection

Code	Function	Page
ESC 6	Selects character set 2.	3-32
ESC 7	Selects character set 1.	3-33



# Control Codes Summary

## Line Spacing

Code	Function	Page
ESC 0	Sets 1/8 in. line spacing.	3-34
ESC 1	Sets 7/72 in. line spacing.	3-35
ESC 2	Sets 1/6 in. line spacing.	3-36
ESC 3	Sets n/216 in. line spacing.	3-37
ESC A	Sets n/72 in. line spacing.	3-39

## Format Control

Code	Function	Page
HT	Horizontal tabulation.	3-40
VT	Vertical tabulation.	3-42
ESC B	Sets vertical tabs.	3-44
ESC D	Sets horizontal tabs.	3-45
NUL	Nul. List terminator.	3-46
ESC C	Sets form length.	3-47
ESC N	Sets skip-over perforation.	3-50
ESC O	Cancels skip-over perforation.	3-52
ESC Q	Sets right margin.	3-54
ESC /	Sets left margin.	3-56

## Input Data Control

Code	Function	Page
DEL	Delete. Cancels last printable data.	3-58
CAN	Cancel. Clears printer buffer.	3-60

# Appendix G. Control Codes Summary

## Miscellaneous

Code	Function	Page
BEL	Sounds the alarm.	3-61
ESC 8	Ignores paper-end detector.	3-62
ESC 9	Enables paper-end detector.	3-63
ESC <	Prints current line from left to right.	3-64
ESC @	Initializes printer.	3-65
ESC U	Sets/cancels unidirectional printing.	3-66
ESC s	Sets/cancels half speed printing.	3-68

## Bit Image

Code	Function	Page
ESC K	Sets normal-density bit image mode.	3-70
ESC L	Sets dual-density bit image mode.	3-80
ESC Y	Sets double-speed dual-density bit image mode.	3-84
ESC Z	Sets quadruple-density bit image mode.	3-85
ESC *	Selects bit image mode.	3-86

## Non-Command Sequence

Code	Function	Page
Self-Test	Power ON while pressing LF.	2-6
Hex Dump	Power ON while pressing LF and FF.	3-4

# Index By Character Code

## Index by Character Code

Code				
Name	Dec	Hex	Function	Page
NUL	0	00	List terminator.	3-46
BEL	7	07	Sounds the alarm.	3-61
BS	8	08	Prints and backs one character.	3-30
HT	9	09	Horizontal tabulation.	3-40
LF	10	0A	Advances paper one line.	3-8
VT	11	0B	Vertical tabulation.	3-42
FF	12	0C	Advances paper to next top of form.	3-11
CR	13	0D	Starts printing.	3-7
SO	14	0E	Sets enlarged print mode.	3-14
SI	15	0F	Sets condensed print mode.	3-17
DC2	18	12	Cancels condensed print mode.	3-19
DC4	20	14	Cancels enlarged print mode set by SO code.	3-15
CAN	24	18	Clears printer buffer.	3-60
ESC	27	1B	Escape. ASCII code for Escape. Precedes numbers, characters, etc.	3-3
ESC *	42	2A	Selects bit image mode.	3-86
ESC -	45	2D	Sets/cancels underline print mode.	3-21
ESC 0	48	30	Sets 1/8 in. line spacing.	3-34
ESC 1	49	31	Sets 7/72 in. line spacing.	3-35
ESC 2	50	32	Sets 1/6 in. line spacing.	3-36
ESC 3	51	33	Sets n/216 in. line spacing.	3-37
ESC 6	52	34	Selects character set 2.	3-32
ESC 7	53	35	Selects character set 1.	3-33
ESC 8	56	38	Ignores paper-end detector.	3-62
ESC 9	57	39	Enables paper-end detector.	3-63
ESC <	60	3C	Prints current line from left to right.	3-64
ESC @	64	40	Initializes printer.	3-65
ESC A	65	41	Sets n/72 in. line spacing.	3-39
ESC B	66	42	Sets vertical tabs.	3-44

# Appendix G. Control Codes Summary

Code				
Name	Dec	Hex	Function	Page
ESC C	67	43	Sets form length.	3-47
ESC D	68	44	Sets horizontal tabs.	3-45
ESC E	69	45	Sets emphasized print mode.	3-22
ESC F	70	46	Cancels emphasized print mode.	3-23
ESC G	71	47	Sets double-strike print mode.	3-24
ESC H	72	48	Cancels double-strike print mode.	3-25
ESC J	74	4A	Feeds n/216 in. line spacing for one line.	3-9
ESC K	75	4B	Sets normal-density bit image mode.	3-70
ESC L	76	4C	Sets dual-density bit image mode.	3-80
ESC M	77	4D	Sets elite-sized character.	3-12
ESC N	78	4E	Sets skip-over perforation.	3-50
ESC O	79	4F	Cancels skip-over perforation.	3-52
ESC P	80	50	Cancels ESC M code.	3-13
ESC Q	81	51	Sets right margin.	3-54
ESC S	83	53	Sets superscript/subscript print mode.	3-26
ESC T	84	54	Cancels superscript/subscript print mode.	3-29
ESC U	85	55	Sets/cancels unidirectional printing.	3-66
ESC W	87	57	Sets/cancels enlarged print mode.	3-16
ESC Y	89	59	Sets double-speed dual-density bit image mode.	3-84
ESC Z	90	5A	Sets quadruple-density bit image mode.	3-85
ESC l	108	6C	Sets left margin.	3-56
ESC s	115	73	Sets/cancels half-speed printing.	3-68
DEL	127	7F	Cancels last printable data.	3-58
NUL	128	80	List terminator.	3-46



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